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# ENERGETIC PROTON DOSE-RESPONSE

# The Relative Biological Effectiveness of Energetic Protons in the Induction of Head and Neck Tumors in Rats

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## Abstract

In previous lifespan studies sponsored jointly by The National Aeronautics and Space Administration and the United States Air Force, rhesus monkeys that were given total body surface exposures of high energy protons experienced an unusual incidence of malignant brain tumors /1/. To investigate the risk of similar tumor occurrence subsequent to solar radiation exposures in humans, 1100 Fischer-344 rats, aged 70 days, were exposed to uniformly distributed head-only doses of spread Bragg Peak protons. They were divided into five dose groups of 200 animals each, with an additional 100 animals for disease control sentinels. The dose groups were zero (sham-irradiated), 2, 4, 8.5 and 18 Gy. Every subject that completed the study received a post-mortem examination including serial sections of the brain for histological verification of tumor occurrence and type. After the proton study was completed, five additional group of rats of the same age, sex and strain was exposed to head-only $^{60}$Co $\gamma$-radiation on the same dose and dose rate schedule as the proton-exposed rats and they were maintained and observed under the same conditions. The five dose groups each consisted of 40 animals, with an additional 20 disease control sentinels, for a total of 220 rats. Total head and neck tumor incidence for both types of radiation in the dose range of 0-8.5 Gy displayed a linear dose-response. The exposed rats had a greater incidence of tumors, especially pituitary chromophobe adenomas, epithelial tumors and mesenchymal cell tumors, than the unexposed controls, but the excessive occurrence of malignant gliomas that had previously been observed in proton-irradiated monkeys was absent in the rats. The hypothesis that the relative biological effectiveness (RBE) of protons in the induction of head and neck tumors was unity could not be rejected; however, a significant increase in precancerous squamous metaplasia was observed in the proton-exposed rats, but not in the $^{60}$Co-exposed animals. We conclude that the occurrence of radiation-induced brain tumors in the rhesus monkeys can be explained by the Bragg Peak dose distribution in susceptible tissues rather than by a high RBE of protons for brain tumor induction.

# Introduction

**Background**. During the period 1964-1969, the U. S. Air Force School of Aerospace Medicine (USAFSAM), with the support of the National Aeronautics and Space Administration (NASA) began an investigation of the immediate and long-term effects of space radiation using immature rhesus monkeys as human surrogates. Monkeys of both sexes were exposed to high-energy protons in various dose and energy combinations to bracket the known spectrum of naturally occurring proton radiation in space. The energies chosen were 32, 55, 138, 400 and 2300 MeV. The life span study included 301 irradiated monkeys and 57 age-matched controls. They were observed continuously to determine the long term effects, especially cancer, cataracts, and lowered life expectancy /1, 2/.

Among the fatal cancers occurring in the monkeys, the most prevalent single type was glioblastoma multiforme, a malignant brain tumor that affected one female and eight males in a group of 72 animals exposed to 55-MeV protons /3/. Protons of this energy will distribute all of their kinetic energy within the first 2.5 cm of tissue, resulting in a non-uniform dose distribution and "hot spots" in the head of a monkey /4/. The surface dose range for the affected monkeys was 4 to 8 Gy, but calculations by the original investigators indicated that some areas of the brain could have received up to three times the measured surface dose because of the Bragg Peak effect /5/. The first brain tumor appeared 18 months after irradiation, while the last occurred 20 years post-exposure. Because most of the internal cranial tumors were not diagnosed until they became symptomatic, they were too large at the time of necropsy for their exact point of origin relative to the body surface to be determined; however, all of the glioblastomas affected areas of the cerebral cortex that could have received more than the measured surface dose of radiation according to the dosimetry models of Leavitt (Figure 1). The short latent period of some of these tumors compared to the latencies reported in known cases of radiation-induced brain tumors in humans (10 years or more) prompted the suspicion that protons might be more effective in tumor induction than the therapeutic radiation treatments that caused secondary tumors later in the life of some human patients. This suspicion was enhanced by the results of concurrent studies of similar aged monkeys that had received whole body doses of 2-MeV x-ray radiation. One of these subjects developed a fatal glioblastoma 284 months after radiation with 5.8 Gy total body

surface dose. This is consistent with the latency that would be expected for tumors that are caused by therapeutic x-rays.

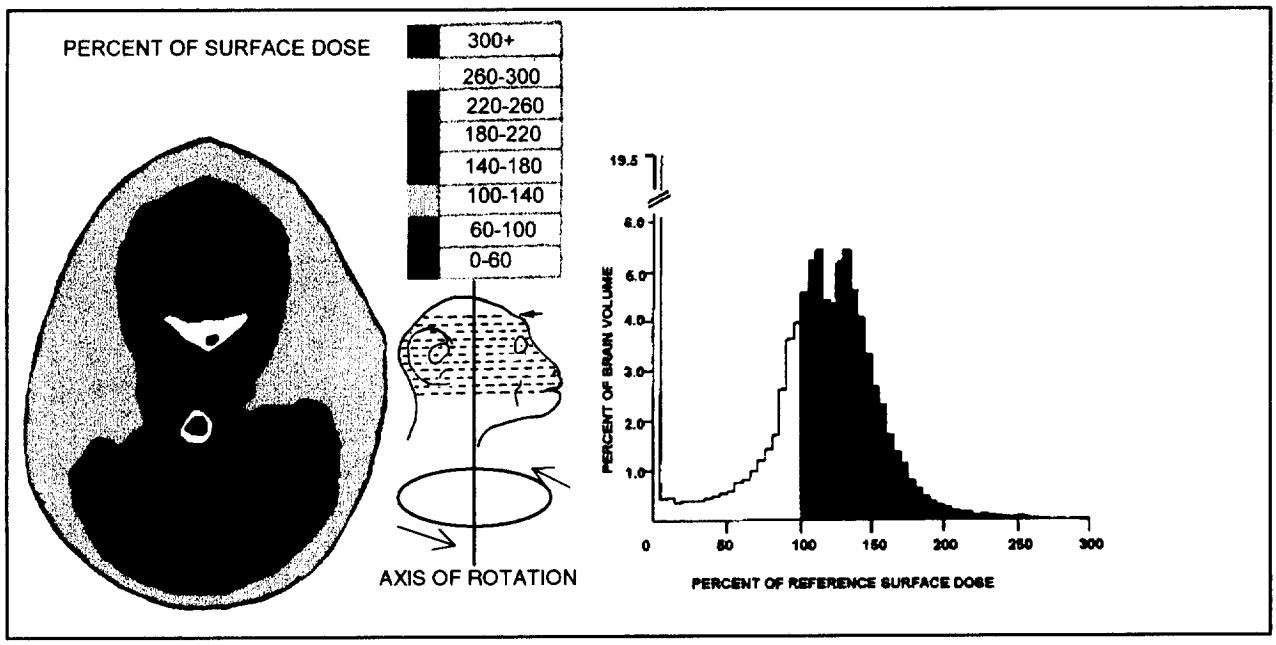


*Figure 1. Dosimetry model of a monkey head rotated in a beam of 55-MeV protons (Modified after Leavitt /5/)*

**Objective.** The present study was undertaken to supplement the primate data by utilizing a large population of Fischer-344 rats to establish the dose-response relationship between Bragg Peak energetic protons and tumors of the head and neck, especially brain tumors. Fischer rats are a frequently used model in carcinogenesis studies because of their relatively low spontaneous solid tumor rate and their well-documented positive response to several known carcinogens. In reviewing brain tumor incidence in control groups of Fischer rats used in 2-year carcinogenesis studies, Solleveld et al., reported that the overall incidence was 1.04% among 1928 subjects and that it never exceeded 4% in any single control group of 50 animals /6/. Because normal brain tumor incidence in humans is well documented, establishment of a dose-response curve for brain tumor induction by proton irradiation will aid in the estimation of cancer risk subsequent to space missions and help establish the probability of causation for those tumors that actually do occur in crew members later in life.

The primate studies were all total body surface exposures. In the rats, only the head was exposed in order to obtain a wider range of brain tumor dose-response than would be available if the high-dose animals were subjected to the life-shortening effects of whole body radiation.

## Methods and Materials

**Proton Exposures.** A total of 1100 male Fischer-344 rats*, aged 70 days, were delivered on July 26, 1989 from the supplier to the Harvard Cyclotron Laboratory, Cambridge, MA, 24 hours prior to the scheduled exposures. The test animals were divided into five dose groups of 200 animals each, and an additional 100 animals were retained for disease control monitoring. The dose groups were zero (sham-irradiated), 2, 4, 8.5 and 18 Gy. Unanesthetized animals were irradiated in groups of eight in a circular restraining device, positioned and shielded so that only the heads were exposed to the proton beam (Figure 2). The 138-MeV beam was attenuated by Lucite filters to produce an expanded Bragg Peak that provided a uniform dose distribution across the area of the entire brain at a rate of approximately 1.25 Gy/min. The dosimetry was verified by exposing rat cadavers containing implanted thermoluminescent dosimeters. Sixteen hours after completion on the exposures, a commercial air carrier shipped the rats to the Veterinary Sciences Facility at the Armstrong Laboratory, Brooks AFB, Texas.

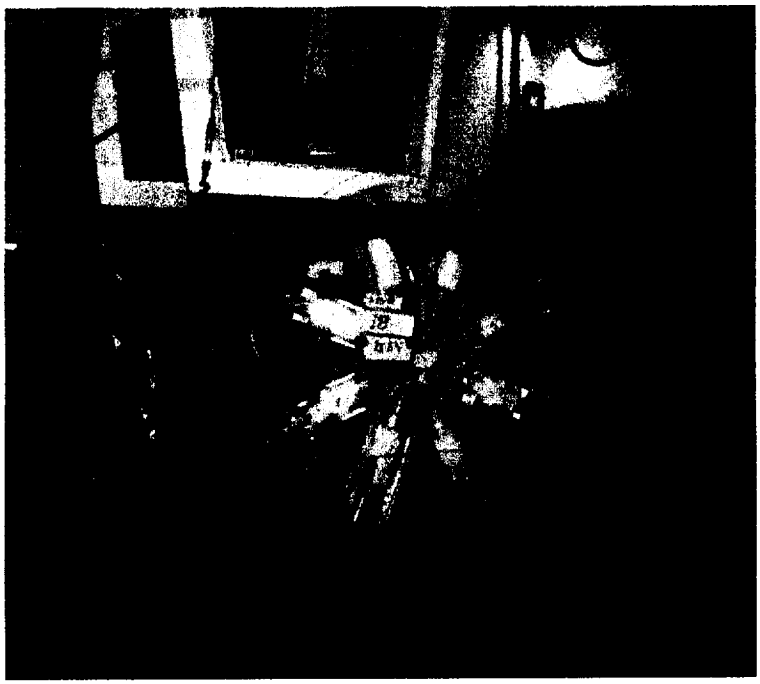

*Figure 2. Restraint device for head-only exposure of rats to the proton beam at the Harvard University Cyclotron Laboratory.*

*CDF® (F-344)/CrlBR, Charles River Laboratories.

During their life span, the subjects were examined twice daily for morbidity and mortality. Subjects that were severely debilitated, in obvious distress, or moribund were euthanatized by carbon dioxide inhalation. At 923 days after irradiation, with less than 2% of the subjects alive, all remaining subjects were killed and examined. Every subject received a post-mortem examination including serial sections of the brain for histological verification of tumor occurrence and type. The Veterinary Pathology Branch at the USAF School of Aerospace Medicine did the tissue processing for the proton study, while Pathology Associates, Inc., Frederick, MD, processed the tissues from the cobalt study.

**Cobalt Exposures.** The potential value of determining the tumor response to $^{60}$Co $\gamma$-radiation became apparent after the data began to accumulate in the proton study. The prevalence of some lesions, notably pre-cancerous squamous metaplasia, suggested that the relative biological effectiveness of protons in the induction of some tumors might differ from unity. To test this hypothesis, an additional group of rats of the same age, sex and strain was exposed to head-only $^{60}$Co $\gamma$-radiation on the same dose and dose rate schedule as the proton-exposed rats and they were maintained and observed under the same conditions. The five dose groups each consisted of 40 subjects, with an additional 20 disease control sentinels, for a total of 220 rats. The cobalt exposures were done at the Southwest Research Institute Cobalt Facility on August 18, 1992 and the last rat died on January 6, 1995, 870 days after irradiation.

**Data Analysis.** For purposes of data analysis, the tumors of the head and neck were grouped in six categories based on the morphological diagnosis of the lesion:

- Brain and meninges
- Pituitary gland, all parts
- Bone and cartilage
- Epithelium and endothelium
- Thyroid gland (follicular cells and C-cells)
- Miscellaneous tumors of mesenchymal origin

A veterinary pathologist (RWT) who is a Diplomate of the American College of Veterinary Pathology did the tumor identification. He submitted any questionable lesions to the

Armed Forces Institute of Pathology for verification of his findings.

Tumor occurrence in each experimental group was expressed as incidence density, or number of tumors versus time at risk. The incidence densities in the irradiated groups were compared with those of the sham-irradiated groups by the method described by Miettinen for obtaining the null chi-squared value with 1 d.f. for incidence in unequal populations /7/. Additionally, the dose response relationship for brain tumors alone, and for all head and neck tumors combined, was calculated by simple linear regression of the incidence densities of these tumors.

The populations of the dose groups in the final analysis were not uniform, owing to inevitable losses associated in an animal life span study with over 1000 subjects. The large discrepancy in the 18-Gy-proton population occurred when 40 of these subjects were lost due to mishandling by the commercial shipper en route from the Harvard Cyclotron Laboratory to the Armstrong Laboratory. The statistical methodology that we used was selected because equal populations are not a requirement for valid statistical interpretations.

## Results

**Survival.** The median ages at death in the proton and cobalt controls were 845 and 825 days respectively. This agrees with control data in Fischer rats published by the National Institute of Environmental Health Sciences National Toxicology Program (NTP) /8/. The high early mortality in the 18-Gy-proton group was primarily attributable to respiratory complications associated with squamous metaplasia of the nasopharynx. This condition was infrequently seen in lower dose groups, where it was never identified as a factor in the animal's death. Similar early mortality was observed in the 18-Gy cobalt group; however, the lesions differed from those in the 18-Gy-proton group. The cobalt subjects did not develop obstructive squamous metaplasia of the nasopharynx, but instead had stomatitis, gingivitis, and malocclusion, resulting in severe malnutrition. Feeding finely crushed food pellets did little to alter the decline of these subjects. Survival data for all groups are given in Table 1 and Figures 3 and 4.

*Table 1. Survival (Weeks) of Male F-344 Rats after Head-Only Irradiation*

| Dose | * Number of Subjects | | Mean Survival Time | | Median Survival Time | | Total Weeks at Risk | |
|---|---|---|---|---|---|---|---|---|
| | Proton | Cobalt | Proton | Cobalt | Proton | Cobalt | Proton | Cobalt |
| 0.0 Gy | 221 | 61 | 104.4 | 107.9 | 110.7 | 114.6 | 23270 | 6659 |
| 2.0 Gy | 196 | 40 | 97.3 | 109.1 | 101.8 | 113.7 | 20060 | 4366 |
| 4.0 Gy | 163 | 40 | 96.8 | 94.7 | 99.9 | 96.6 | 15671 | 3786 |
| 8.5 Gy | 195 | 37 | 90.0 | 85.9 | 91.3 | 86.7 | 17818 | 3092 |
| 18.0 Gy | 156 | 38 | 39.0 | 28.7 | 33.6 | 21.0 | 5582 | 1088 |

* Different from the total number of rats exposed because data from some of the exposed subjects was unobtainable (see Data Analysis). Additional control data came from unused disease control sentinels.

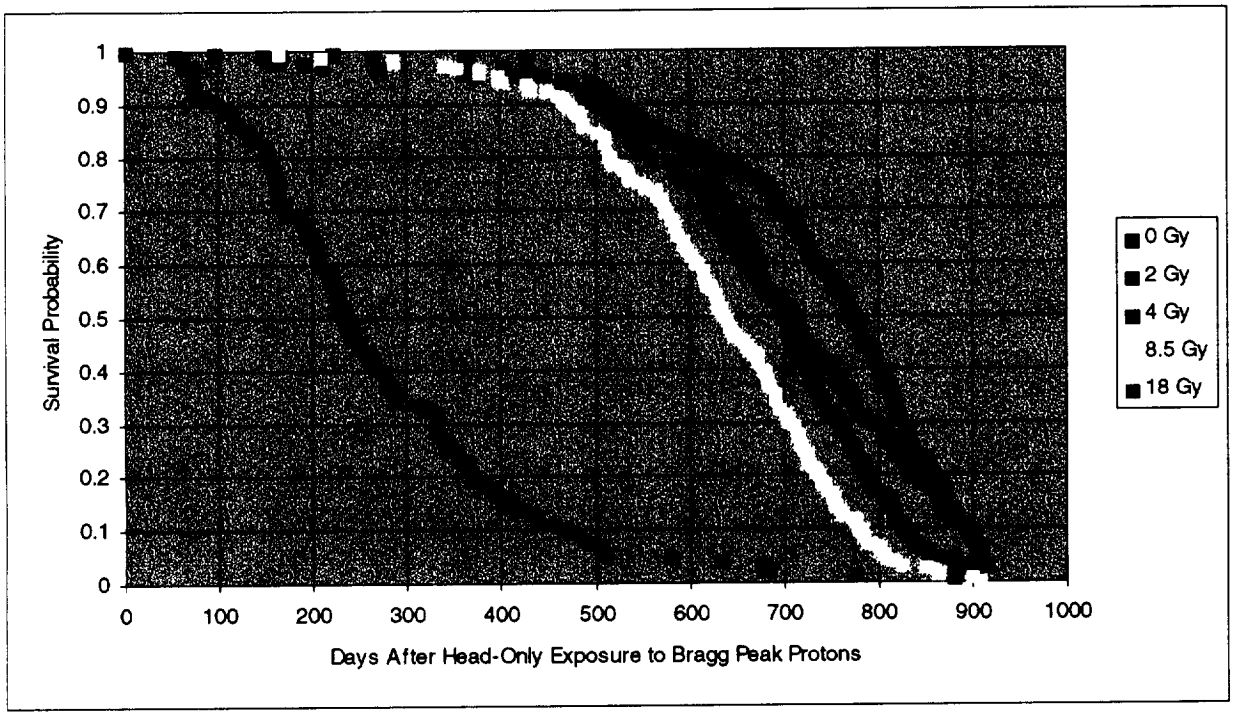


*Figure 3. Kaplan-Meier survival probability of male F-344 rats after head-only exposure to Bragg Peak protons.*

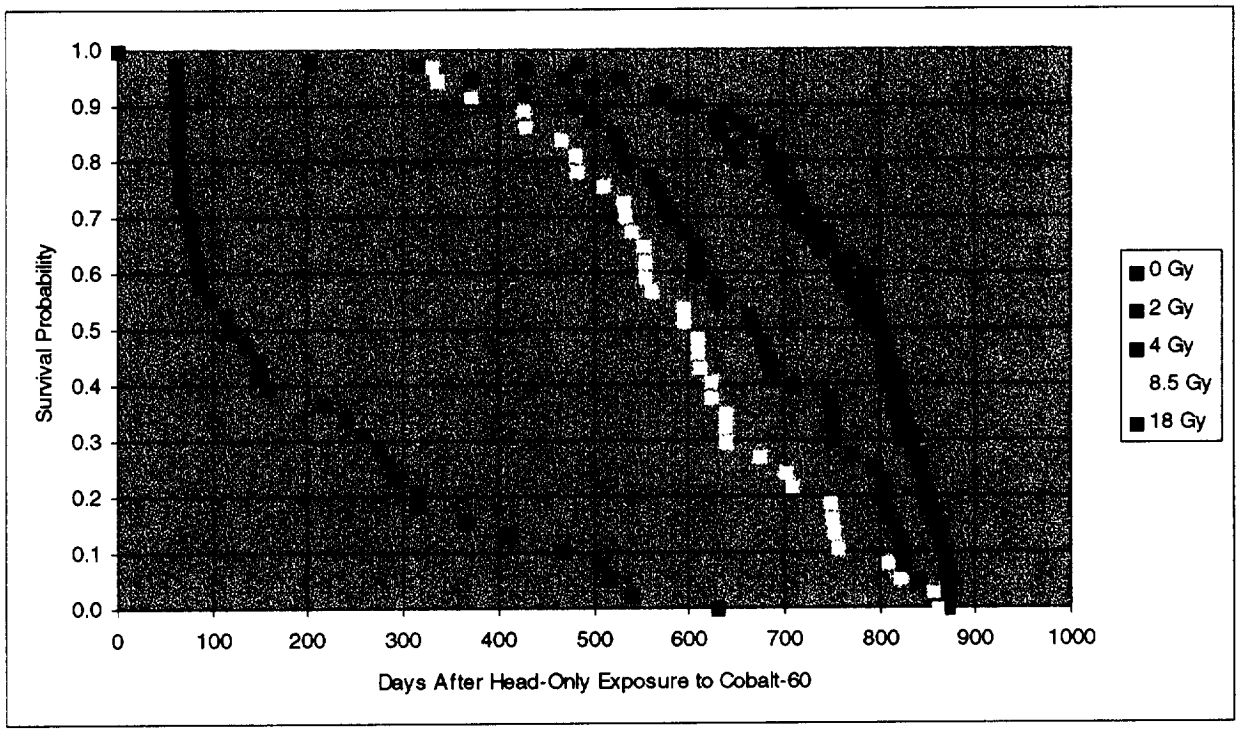


*Figure 4. Kaplan-Meier survival probability of male F-344 rats after head-only exposure to $^{60}Co$ γ-radiation*

The high early mortality in the 18-Gy groups undoubtedly precluded the expression of many tumors with long latent periods. Squamous metaplasia of the nasopharynx rarely occurs spontaneously, but is commonly seen as a response to chronically inhaled irritants. It is regarded as pre-cancerous and might develop into squamous cell carcinoma /8/.

**Solid Tumors.** For both proton and cobalt irradiation, there was a dose-ordered incidence of total head and neck tumors that displayed a high degree of linearity, if data from the 18-Gy group were excluded from the regression (Figure 5). The slope of the regression line for protons predicts that the dose that would be required to double the naturally occurring number of all tumors of the head and neck would be 4.7 Gy. The correlation coefficient (r = 0.9960) indicates that the slope was very significantly different from zero. Similarly, the doubling dose of $^{60}C$ γ-radiation was estimated to be 2.4 Gy (r = 0.9944). When only tumors of the brain and meninges were considered, the proton data indicated that the dose required to double the naturally occurring incidence would be 7.9 Gy; however, the correlation coefficient was not sufficient (r = 0.8508) to conclude that the slope was not zero. Similarly, the cobalt data showed even greater scatter (r = 0.2906); therefore, when only brain and meningeal tumors were considered, the data

were inconclusive.

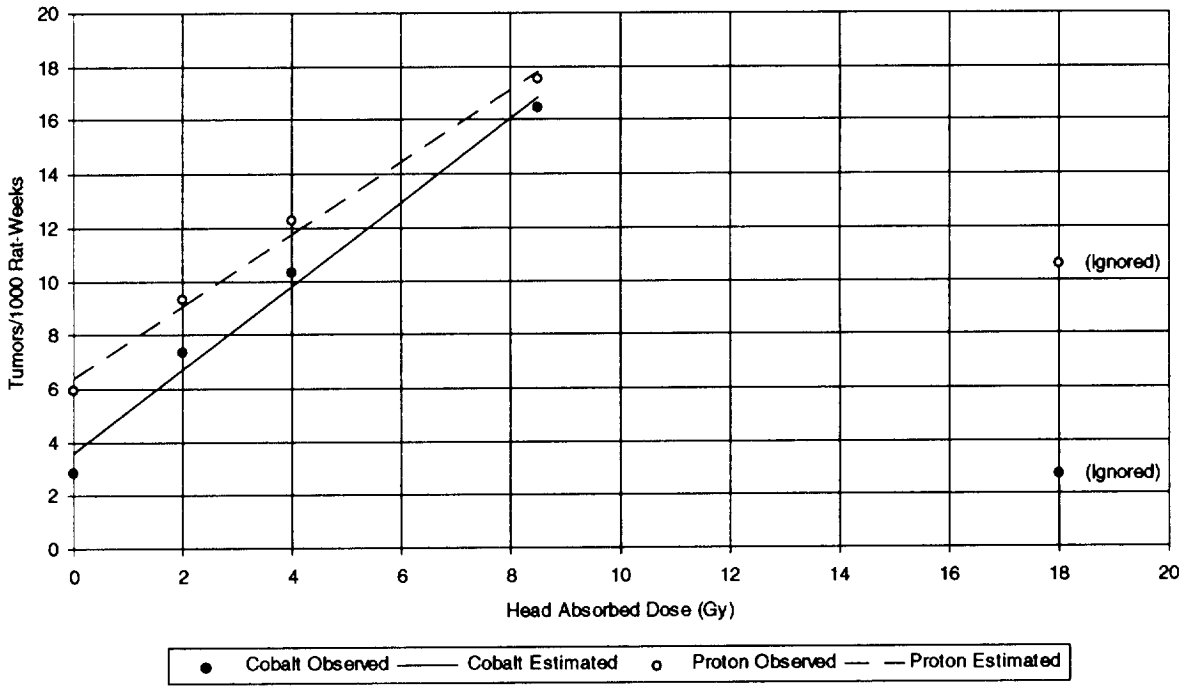


*Figure 5 Incidence density plot of all head and neck tumors by dose group. Linear regressions exclude 18 Gy points.*

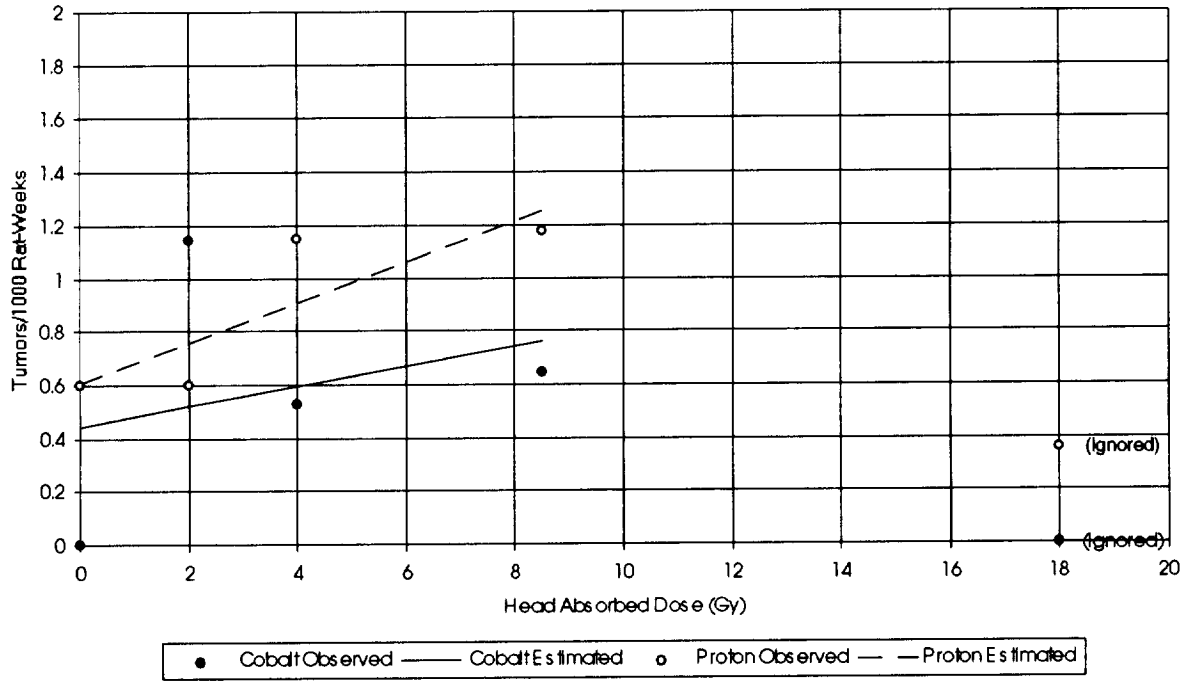


*Figure 6. Incidence density plot of brain tumors by dose group. Linear regression excludes the 18 Gy points.*

When the tumors were grouped by cell type, significant increases in the incidence of all

categories, especially pituitary chromophobe adenomas, epithelial cell, and mesenchymal cell tumors, were identified by $\chi^2$ testing (Figure 7).

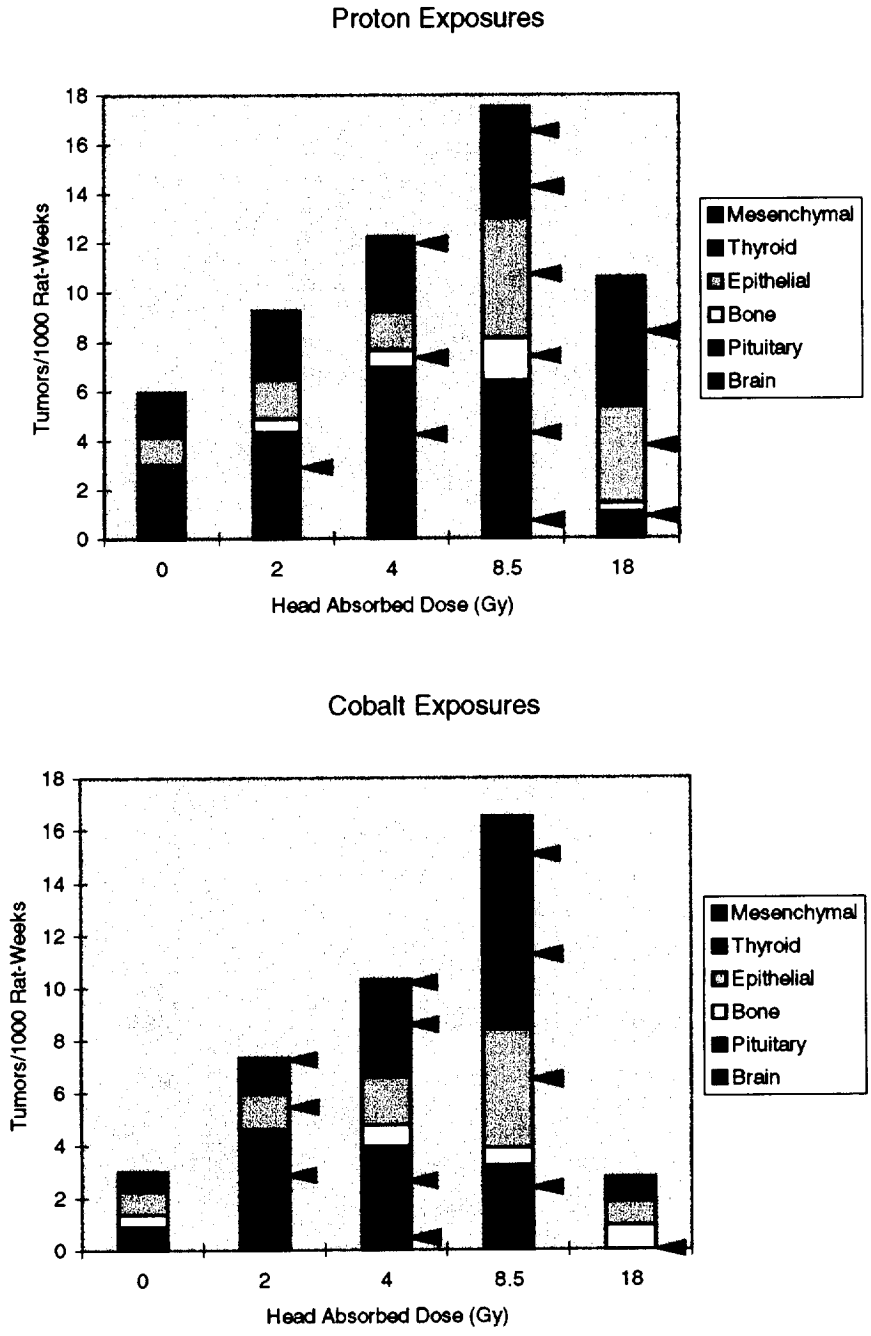


*Figure 7. Life span incidence of head and neck tumors by primary cell type. Black arrows mark values that are significant (outside the 95th percentile of the $\chi^2$ distribution with 1 d.f. when comparing incidence density in experimental groups with that of controls). Red arrows indicate values that are significantly less than corresponding control values.*

**Leukemia.** Aging Fischer rats have a high incidence of fatal mononuclear cell leukemia (MCL), which accounted for many of the deaths in all groups, including the controls. The natural incidence of MCL in male rats is reported to be approximately 30% /10/. The data upon which this is based are primarily from 2-year carcinogenesis studies; therefore, the figure might be slightly higher in subjects such as ours that are allowed to complete their entire life span. MCL is seldom seen in rats that die before 16 months of age, but it is the cause of 50% of the naturally occurring deaths in Fischer rats under 20 months of age /10/. The incidence in our study is shown in Figure 8.

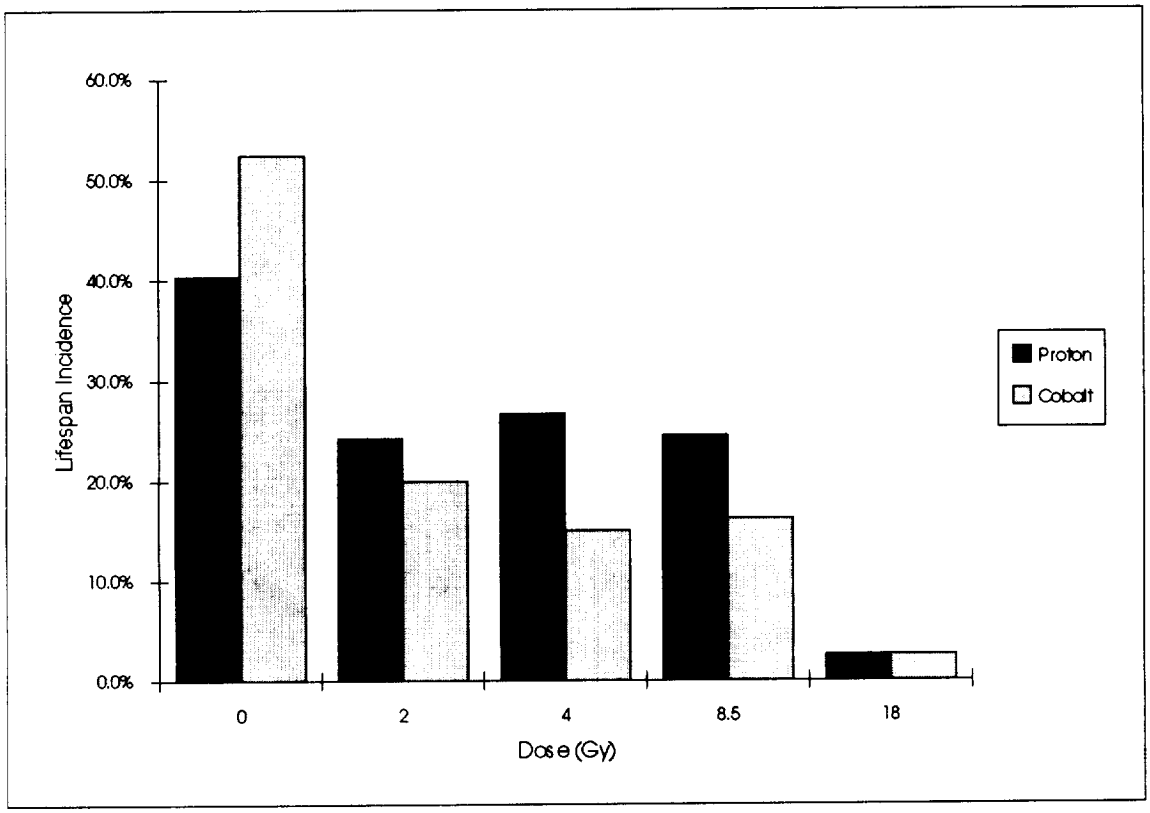


*Figure 8. Life span incidence of mononuclear cell leukemia in rats exposed to head-only proton or $^{60}Co$ γ irradiation.*

For either radiation type, the lifetime incidence was directly related to the average longevity of the subjects, irrespective of the dose of radiation that was absorbed by the head.

## Discussion and Conclusions

The combined incidence of all head and neck tumors in irradiated rats was significantly greater than that in the controls in every exposure group except the high dose Cobalt exposures. Most of these tumors were identified on post-mortem examination and were not the primary cause of death. Pituitary adenomas accounted for the greater part of this increase in the 2 and 4-Gy groups, while epithelial and mesenchymal cell tumors were more prevalent in the 8.5 and 18-Gy groups. The 18-Gy-proton group had a significantly lower incidence of pituitary tumors than the controls, probably because of the high mortality from other causes during the latent period of the tumor. There was no relationship between the exposure to energetic protons and the occurrence of malignant gliomas of the type that was seen in proton-irradiated monkeys. The life span incidence of brain tumors (all types) in the proton control group was 6.3 % (14/221), compared with 1.04 % (20/1928), in the NTP control rats that were sacrificed at the two-year point /8/. At the two-year point in the proton study, the control rats had accumulated 21290 rat-weeks at risk, while the end of the experiment the total was 23270. The additional 1980 weeks at risk in elderly rats might, at least in part, account for the observed five-fold difference in brain tumor incidence between the two-year and life span control subjects. It is also possible that the serial sectioning technique employed by the pathologist in locating microscopic tumors resulted in a high efficiency of identification. The only experimental group that had a significantly higher brain tumor incidence than the controls was the 8.5-Gy-proton group, which also had significantly higher incidence in every category of tumor. Referring to Figure 7, the largest percentage increase in any type of tumor in the 8.5-Gy-proton group was in bone tumors (8.3 x control), while the smallest was in thyroid tumors (1.7 x control). The increases in brain and pituitary tumors were nearly the same (2.0 and 2.4 x control), while the increases in miscellaneous epithelial and mesenchymal cell tumors were slightly higher (4.2 and 5.2 x control). We conclude that the thyroid, brain and pituitary would be among the least sensitive of the tissues of the head and neck to the carcinogenic effects of high energy protons, while the epithelium, and all mesenchymal tissues including bone would be the most vulnerable. Regarding the high incidence malignant gliomas in proton-irradiated monkeys, the evidence suggests that the effect is related to the unequal dose distribution of the 55-MeV protons, and that the tumors probably were initiated

in those areas that received considerably more than the measured surface dose.

Irradiation of the head did not cause an increase in the incidence of leukemia. This might be attributable to the fact that most blood forming tissues were excluded from the radiation field; however, in studies by others, the rate of MCL has also shown a similar lack of response to orally administered chemical carcinogens /11/. Our data agree with the hypothesis that MCL risk is related to age and is independent of radiation dose to the head. We conclude that, although leukemia was a significant cause of mortality, it was not a confounding factor in the interpretation of solid tumor data.

The fact that both 18-Gy groups had similar mortality patterns but dissimilar lesions related to that mortality was an intriguing puzzle. It appears reasonable to suggest that the damage at the macromolecular level that is caused by Bragg Peak Protons is different from damage caused by $^{60}$Co $\gamma$-photons.

We conclude that, based on a rat model, the RBE of Bragg Peak protons for the induction of all types of head and neck tumors combined is not significantly different from unity. The attempt to extend the dose-response curve in rats to 18 Gy was not a success due to the debilitating subacute effects in the rats at this dose of either cobalt or proton radiation. The early deaths of these subjects limited the usefulness of the rodent model in assessing the risk of the specific type of malignant tumor (glioblastoma) that occurred in the proton-exposed monkeys because of the relatively long latent period of radiation-induced neural tumors. Nevertheless, the similar incidence densities of all types of tumors combined at all doses in the range of 2 - 8.5 Gy suggests that equal absorbed doses of cobalt and solar proton radiation will result in similar risk of neural tumors in species that have a longer life span than rats.

During extended space travel, such as a manned mission to Mars, adequate radiation risk assessment will depend on having an accurate record of the energy spectrum of the solar protons that contribute to the measured surface absorbed dose. Because of the unequal dose distribution along the path of those protons that have insufficient energy to pass completely through the head, the risk of brain tumors will depend on the amount of energy absorbed at the site of radiation-sensitive tissues.

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| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
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| 911597 | 0 | 18-Jun-91 | | | | | | 1 | 1 | |
| 911692 | 0 | 21-Jun-91 | | | | | | | 0 | |
| 911701 | 0 | 25-Jun-91 | | | | | 1 | | 1 | |
| 911950 | 0 | 1-Jul-91 | | | | | | | 0 | |
| 911953 | 0 | 1-Jul-91 | | | | 1 | | | 1 | |
| 911978 | 0 | 2-Jul-91 | | | | | | | 0 | |
| 911988 | 0 | 5-Jul-91 | 1 | 1 | | | | | 2 | |
| 911989 | 0 | 5-Jul-91 | | | | | | | 0 | |
| 911996 | 0 | 8-Jul-91 | | | | | | | 0 | |
| 912078 | 0 | 10-Jul-91 | | | | | | | 0 | |
| 912079 | 0 | 10-Jul-91 | | 1 | | 1 | | | 2 | |
| 912148 | 0 | 12-Jul-91 | | 1 | | | | | 1 | |
| 912157 | 0 | 15-Jul-91 | | 1 | | | | | 1 | |
| 912158 | 0 | 16-Jul-91 | | 1 | | | 1 | | 2 | |
| 912160 | 0 | 16-Jul-91 | | | | | | | 0 | |
| 912168 | 0 | 17-Jul-91 | | 1 | 1 | | | | 2 | |
| 912169 | 0 | 17-Jul-91 | | | | | | | 0 | |
| 912170 | 0 | 17-Jul-91 | | | | | | | 0 | |
| 912178 | 0 | 19-Jul-91 | | | | | | | 0 | |
| 912181 | 0 | 22-Jul-92 | | 1 | | | | | 1 | |
| 912185 | 0 | 22-Jul-91 | | | 1 | | | | 1 | |
| 912186 | 0 | 22-Jul-91 | | | | | | | 0 | |
| 912249 | 0 | 26-Jul-91 | | | | | | | 0 | |
| 912251 | 0 | 26-Jul-91 | | | | | | | 0 | |
| 912257 | 0 | 29-Jul-91 | | | | | | | 0 | |
| 912308 | 0 | 1-Aug-91 | | 1 | 1 | | | | 2 | |
| 912330 | 0 | 7-Aug-91 | | | | | | | 0 | |
| 912337 | 0 | 7-Aug-91 | 1 | 2 | | | 1 | | 4 | |
| 912345 | 0 | 13-Aug-91 | | | | | | | 0 | |
| 912349 | 0 | 13-Aug-91 | | | | | | | 0 | |
| 912350 | 0 | 13-Aug-91 | | | | | | | 0 | |
| 912351 | 0 | 13-Aug-91 | | | | | | | 0 | |
| 912353 | 0 | 13-Aug-91 | | 1 | | | | | 1 | |
| 912510 | 0 | 20-Aug-91 | | | | | 1 | | 1 | |
| 912519 | 0 | 22-Aug-91 | 1 | | | | 1 | | 2 | |
| 912522 | 0 | 23-Aug-91 | | 1 | | | | | 1 | |
| 912526 | 0 | 26-Aug-91 | | 1 | | | 1 | | 2 | |
| 912528 | 0 | 26-Aug-91 | | | | | | | 0 | |
| 912530 | 0 | 27-Aug-91 | | | | | | | 0 | |
| 912600 | 0 | 28-Aug-91 | | | | | | | 0 | |
| 912614 | 0 | 29-Aug-91 | | | | | | | 0 | |
| 912616 | 0 | 29-Aug-91 | | | | | | | 0 | |
| 912622 | 0 | 30-Aug-91 | | | | | | | 0 | |
| 912624 | 0 | 3-Sep-91 | | 1 | | | 1 | 1 | 3 | |
| 912626 | 0 | 3-Sep-91 | | 1 | | | | 1 | 2 | |
| 912820 | 0 | 5-Sep-91 | | 1 | | | | | 1 | |
| 912833 | 0 | 6-Sep-91 | | | | | | | 0 | |
| 912836 | 0 | 9-Sep-91 | | | | 1 | | | 1 | |
| 912837 | 0 | 9-Sep-91 | | | | 1 | | | 1 | |
| 912841 | 0 | 9-Sep-91 | | | | | | | 0 | |
| 912957 | 0 | 10-Sep-91 | | 1 | | | | | 1 | |
| 912959 | 0 | 10-Sep-91 | | | | | | | 0 | |
| 912963 | 0 | 11-Sep-91 | | | | | | | 0 | |
| 912964 | 0 | 11-Sep-91 | | 1 | | 1 | | | 2 | |
| 912980 | 0 | 16-Sep-91 | | | | | 1 | | 1 | |
| 912984 | 0 | 17-Sep-91 | | 1 | | | 1 | | 2 | |
| 913032 | 0 | 22-Sep-91 | | 1 | | | | | 1 | |
| 913033 | 0 | 24-Sep-91 | | | | | | | 0 | |
| 913034 | 0 | 24-Sep-91 | | | | | | | 0 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 913035 | 0 | 24-Sep-91 | | | | | 1 | | 1 | |
| 913036 | 0 | 24-Sep-91 | | | | | | | 0 | |
| 913050 | 0 | 26-Sep-91 | | | | | | | 0 | |
| 913051 | 0 | 26-Sep-91 | | | | | 1 | | 1 | |
| 913055 | 0 | 27-Sep-91 | | | | | | | 0 | |
| 913118 | 0 | 1-Oct-91 | | | | | | | 0 | |
| 913120 | 0 | 1-Oct-91 | | 1 | | | | | 1 | |
| 913121 | 0 | 1-Oct-91 | | | | 1 | | 1 | 2 | |
| 913130 | 0 | 4-Oct-91 | | | | | | 1 | 1 | |
| 913133 | 0 | 6-Oct-91 | | | | | | | 0 | |
| 913134 | 0 | 5-Oct-91 | | | | | | | 0 | |
| 913137 | 0 | 7-Oct-91 | | | | | | | 0 | |
| 913139 | 0 | 7-Oct-91 | | | | | 1 | | 1 | |
| 913141 | 0 | 8-Oct-91 | | 1 | | | | | 1 | |
| 913154 | 0 | 10-Oct-91 | | 1 | | | | | 1 | |
| 913157 | 0 | 11-Oct-91 | | 1 | | | | | 1 | |
| 913159 | 0 | 11-Oct-91 | | | | | | | 0 | |
| 913160 | 0 | 14-Oct-91 | | | | | | | 0 | |
| 913161 | 0 | 15-Oct-91 | | 1 | | | 1 | | 2 | |
| 913165 | 0 | 15-Oct-91 | | | | | | | 0 | |
| 913168 | 0 | 16-Oct-91 | | | | | | | 0 | |
| 913171 | 0 | 17-Oct-91 | | | | | | | 0 | |
| 913172 | 0 | 17-Oct-91 | | 1 | | | | | 1 | |
| 913173 | 0 | 17-Oct-91 | 1 | | | | | | 1 | |
| 913176 | 0 | 18-Oct-91 | | | | | | | 0 | |
| 913177 | 0 | 20-Oct-91 | | 1 | | | | | 1 | |
| 913178 | 0 | 21-Oct-91 | | 1 | | | 1 | | 2 | |
| 913179 | 0 | 21-Oct-91 | | | | | | | 0 | |
| 913181 | 0 | 21-Oct-91 | | 1 | | | 1 | | 2 | |
| 913345 | 0 | 28-Oct-91 | | | | | | 1 | 1 | |
| 913346 | 0 | 28-Oct-91 | | 1 | | | | | 1 | |
| 913348 | 0 | 28-Oct-91 | | | | | | | 0 | |
| 913349 | 0 | 29-Oct-91 | | | | | | | 0 | |
| 913350 | 0 | 29-Oct-91 | | | | | | | 0 | |
| 913352 | 0 | 29-Oct-91 | | 1 | | | | | 1 | |
| 913354 | 0 | 30-Oct-91 | | | | | | | 0 | |
| 913356 | 0 | 31-Oct-91 | | | | 1 | | | 1 | |
| 913361 | 0 | 1-Nov-91 | 1 | 1 | | | 1 | | 3 | |
| 913362 | 0 | 1-Nov-91 | | 1 | | 1 | | | 2 | |
| 913367 | 0 | 4-Nov-91 | | | | | | | 0 | |
| 913368 | 0 | 4-Nov-91 | | 1 | | | | | 1 | |
| 913384 | 0 | 6-Nov-91 | | | | | | | 0 | |
| 913386 | 0 | 6-Nov-91 | | | | | | | 0 | |
| 913499 | 0 | 7-Nov-91 | | | | | | 1 | 1 | |
| 913515 | 0 | 19-Nov-91 | | | | | | | 0 | |
| 913522 | 0 | 19-Nov-91 | | | | | | | 0 | |
| 913523 | 0 | 20-Nov-91 | | | | 1 | | | 1 | |
| 913527 | 0 | 21-Nov-91 | 1 | | | | | | 1 | |
| 913528 | 0 | 21-Nov-91 | | | | | | | 0 | |
| 913530 | 0 | 21-Nov-91 | | 1 | | | | | 1 | |
| 913579 | 0 | 22-Nov-91 | | 1 | | | | | 1 | |
| 913580 | 0 | 22-Nov-91 | | | | | | | 0 | |
| 913582 | 0 | 25-Nov-91 | | | | | | | 0 | |
| 913585 | 0 | 26-Nov-91 | | | | | | | 0 | |
| 913588 | 0 | 29-Nov-91 | | | | 1 | | | 1 | |
| 913678 | 0 | 3-Dec-91 | | 1 | | | | | 1 | |
| 913690 | 0 | 4-Dec-91 | | | | | | | 0 | |
| 913691 | 0 | 5-Dec-91 | | | | | | | 0 | |
| 913694 | 0 | 6-Dec-91 | | 1 | | 1 | | | 2 | |
| 913698 | 0 | 7-Dec-91 | | | | | 1 | | 1 | |
| 913699 | 0 | 8-Dec-91 | | | | | | | 0 | |
| 913700 | 0 | 9-Dec-91 | | 1 | | | | | 1 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 913701 | 0 | 9-Dec-91 | | | | | | | 0 | |
| 913790 | 0 | 13-Dec-91 | | | | | 1 | | 1 | |
| 913792 | 0 | 14-Dec-91 | | 1 | | | | | 1 | |
| 913804 | 0 | 15-Dec-91 | | | | 2 | | | 2 | |
| 913805 | 0 | 15-Dec-91 | | | | | | | 0 | |
| 913825 | 0 | 16-Dec-91 | 1 | | | | | | 1 | |
| 913827 | 0 | 17-Dec-91 | | | | | 1 | | 1 | |
| 913828 | 0 | 17-Dec-91 | | | | | | | 0 | |
| 913833 | 0 | 18-Dec-91 | | | | | | | 0 | |
| 913868 | 0 | 24-Dec-91 | | | | | | | 0 | |
| 913869 | 0 | 24-Dec-91 | | | | | | | 0 | |
| 913895 | 0 | 30-Dec-91 | | | | | | | 0 | |
| 920006 | 0 | 6-Jan-92 | | | | | 1 | | 1 | |
| 920008 | 0 | 6-Jan-92 | | 1 | | 1 | | | 2 | |
| 920071 | 0 | 7-Jan-92 | | 1 | | | | 1 | 2 | |
| 920089 | 0 | 8-Jan-92 | | 1 | | | 1 | | 2 | |
| 920129 | 0 | 9-Jan-92 | | | | | 1 | | 1 | |
| 920132 | 0 | 9-Jan-92 | | | | | | | 0 | |
| 920135 | 0 | 10-Jan-92 | | | | | | | 0 | |
| 920138 | 0 | 10-Jan-92 | | | | | | | 0 | |
| 920142 | 0 | 10-Jan-92 | | | | | | | 0 | |
| 920227 | 0 | 15 Jan-92 | | | | | 1 | | 1 | |
| 920228 | 0 | 15 Jan-92 | | 1 | | 1 | 1 | | 3 | |
| 920285 | 0 | 23-Jan-92 | | | | | | | 0 | |
| 920287 | 0 | 22-Jan-92 | | | | | 1 | | 1 | |
| 920289 | 0 | 27-Jan-92 | | | | | | | 0 | |
| 920293 | 0 | 28-Jan-92 | | | | | | | 0 | |
| 920294 | 0 | 28-Jan-92 | | | | | 2 | | 2 | |
| 920295 | 0 | 28-Jan-92 | | 1 | | | | | 1 | |
| 920306 | 0 | 30-Jan-92 | | 1 | | | 1 | | 2 | |
| 920307 | 0 | 30-Jan-92 | | | | | | | 0 | |
| 920309 | 0 | 30-Jan-92 | 1 | 1 | | | | | 2 | |
| 920311 | 0 | 30-Jan-92 | | | | | | | 0 | |
| 920314 | 0 | 31-Jan-92 | | | | | | | 0 | |
| 920315 | 0 | 31-Jan-92 | | | | | | | 0 | |
| 920316 | 0 | 31-Jan-92 | | | | | 1 | | 1 | |
| 900236 | 2 | 28-Feb-90 | 1 | | | | | | 1 | |
| 900555 | 2 | 3-May-90 | | | | 1 | | | 1 | |
| 900905 | 2 | 19-Jul-90 | | | | | 1 | | 1 | |
| 901462 | 2 | 26-Sep-90 | | | | | | | 0 | |
| 901463 | 2 | 26-Sep-90 | | | | | | | 0 | |
| 901464 | 2 | 26-Sep-90 | | | | | | | 0 | |
| 901468 | 2 | 26-Sep-90 | | | | | | | 0 | |
| 901599 | 2 | 30-Oct-90 | | | | | | | 0 | |
| 901706 | 2 | 7-Nov-90 | | | | 1 | | | 1 | |
| 901810 | 2 | 28-Nov-90 | | | | | | | 0 | |
| 901846 | 2 | 4-Dec-90 | | | | | | | 0 | |
| 901854 | 2 | 10-Dec-90 | | | | | | | 0 | |
| 901856 | 2 | 10-Dec-90 | | 1 | | | | | 1 | |
| 901865 | 2 | 14-Dec-90 | | | | 1 | | | 1 | |
| 901868 | 2 | 15-Dec-90 | | | | | | | 0 | |
| 902013 | 2 | 19-Dec-90 | | | | 1 | | | 1 | |
| 902033 | 2 | 25-Dec-90 | | | | | | | 0 | |
| 902038 | 2 | 31-Dec-90 | | | | | | | 0 | |
| 910019 | 2 | 10-Jan-91 | | | | | | 1 | 1 | |
| 910020 | 2 | 10-Jan-91 | 1 | | | | | | 1 | |
| 910027 | 2 | 14-Jan-91 | | | | 1 | | | 1 | |
| 910085 | 2 | 18-Jan-91 | | | | | | | 0 | |
| 910089 | 2 | 23Jan-91 | | | | | | | 0 | |
| 910091 | 2 | 30-Jan-91 | | | | | | | 0 | |
| 910134 | 2 | 4-Feb-91 | | | | | | | 0 | |
| 910208 | 2 | 7-Feb-91 | | | | | | | 0 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 910213 | 2 | 14-Feb-91 | 1 | | | | | | 1 | |
| 910466 | 2 | 17-Feb-91 | | | | 1 | 1 | | 2 | |
| 910493 | 2 | 25-Feb-91 | | | | | | | 0 | |
| 910512 | 2 | 11-Mar-91 | | | | | | | 0 | |
| 910536 | 2 | 12-Mar-91 | | | | | | | 0 | |
| 910838 | 2 | 13-Mar-91 | 1 | 1 | | | | 1 | 3 | |
| 910840 | 2 | 14-mar-91 | | | | 1 | | | 1 | |
| 910853 | 2 | 15-Mar-91 | 1 | | | | | | 1 | |
| 910854 | 2 | 15-Mar-91 | | 1 | | | | | 1 | |
| 910855 | 2 | 15-Mar-91 | | | | | | 1 | 1 | |
| 910858 | 2 | 18-Mar-91 | | | | | | | 0 | |
| 910930 | 2 | 20-Mar-91 | | 1 | | | | | 1 | |
| 910958 | 2 | 22-Mar-91 | | | | | | | 0 | |
| 910983 | 2 | 2-Apr-91 | | | | | | | 0 | |
| 910986 | 2 | 3-Apr-91 | | | | | | | 0 | |
| 910989 | 2 | 3-Apr-91 | | | | | | | 0 | |
| 910990 | 2 | 3-Apr-91 | | | | | 2 | | 2 | |
| 911029 | 2 | 4-Apr-91 | | | | | | | 0 | |
| 911039 | 2 | 6-Apr-91 | | 1 | | | | | 1 | |
| 911052 | 2 | 10-Apr-91 | | | | | | | 0 | |
| 911054 | 2 | 11-Apr-91 | | | | | | | 0 | |
| 911071 | 2 | 12-Apr-91 | | 1 | | 1 | | | 2 | |
| 911073 | 2 | 12-Apr-91 | | 1 | | | | | 1 | |
| 911079 | 2 | 16-Apr-91 | | 1 | | | | | 1 | |
| 911081 | 2 | 16-Apr-91 | | 1 | | | | 1 | 2 | |
| 911085 | 2 | 17-Apr-91 | | 1 | | | | | 1 | |
| 911088 | 2 | 17-Apr-91 | | | | 1 | | | 1 | |
| 911089 | 2 | 18-Apr-91 | | | | 1 | | | 1 | |
| 911101 | 2 | 22-Apr-91 | | | | | | | 0 | |
| 911183 | 2 | 26-Apr-91 | | | | 1 | | 1 | 2 | |
| 911184 | 2 | 26-Apr-91 | | 1 | | | | | 1 | |
| 911219 | 2 | 29-Apr-91 | | 1 | | | | | 1 | |
| 911221 | 2 | 29-Apr-91 | | | | | | | 0 | |
| 911226 | 2 | 1-May-91 | | | | 1 | | | 1 | |
| 911262 | 2 | 6-May-91 | | | | | | 1 | 1 | |
| 911289 | 2 | 9-May-91 | | | | | | | 0 | |
| 911293 | 2 | 13-May-91 | | | | 1 | | | 1 | |
| 911294 | 2 | 13-May-91 | | | | 1 | | | 1 | |
| 911295 | 2 | 13-May-91 | | 1 | | | 1 | 1 | 3 | |
| 911297 | 2 | 13-May-91 | | | | | | | 0 | |
| 911321 | 2 | 17-May-91 | | 1 | | | 1 | 1 | 3 | |
| 911322 | 2 | 17-May-91 | | | | | | | 0 | |
| 911324 | 2 | 20-May-91 | | 1 | | | 2 | | 3 | |
| 911325 | 2 | 20-May-91 | | 1 | | | 1 | 1 | 3 | |
| 911326 | 2 | 20-May-91 | | | 1 | 1 | | 1 | 3 | |
| 911327 | 2 | 20-May-91 | | 1 | | | | | 1 | |
| 911328 | 2 | 20-May-91 | | 1 | 1 | 1 | | | 3 | |
| 911329 | 2 | 20-May-91 | | 1 | | | | | 1 | |
| 911334 | 2 | 22-May-91 | 1 | 1 | | | | | 2 | |
| 911335 | 2 | 22-May-91 | | | | | 1 | | 1 | |
| 911336 | 2 | 22-May-91 | | | | | 1 | | 1 | |
| 911351 | 2 | 23-May-91 | | | 1 | | | | 1 | |
| 911371 | 2 | 25-May-91 | | | | | 1 | | 1 | |
| 911372 | 2 | 28-May-91 | | | | | | | 0 | |
| 911373 | 2 | 28-May-91 | | 1 | | | 1 | 1 | 3 | |
| 911374 | 2 | 28-May-91 | | | | | | | 0 | |
| 911376 | 2 | 28-May-91 | | | | | | | 0 | |
| 911377 | 2 | 28-May-91 | | | | | | | 0 | |
| 911381 | 2 | 29-May-91 | | 1 | | | | | 1 | 1 |
| 911449 | 2 | 30-May-91 | | 1 | | | | | 1 | |
| 911453 | 2 | 30-May-91 | | | | | | | 0 | |
| 911470 | 2 | 3-Jun-91 | | | | 1 | | | 1 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 911482 | 2 | 5-Jun-91 | 1 | | | | | | 1 | |
| 911503 | 2 | 9-Jun-91 | 1 | | | | | | 1 | |
| 911596 | 2 | 18-Jun-91 | | | | 1 | | | 1 | |
| 911698 | 2 | 24-Jun-91 | | | 1 | | | | 1 | |
| 911699 | 2 | 24-Jun-91 | | | 1 | | | | 1 | |
| 911947 | 2 | 28-Jun-91 | | 1 | | | | | 1 | |
| 911948 | 2 | 28-Jun-91 | | | | | | | 0 | |
| 911951 | 2 | 1-Jul-91 | | 1 | | | | | 1 | |
| 911985 | 2 | 5-Jul-91 | | 1 | | | | | 1 | |
| 911993 | 2 | 8-Jul-91 | | | | | | | 0 | |
| 911997 | 2 | 8-Jul-91 | | | | | | 1 | 1 | |
| 911998 | 2 | 8-Jul-91 | | 1 | | | | | 1 | |
| 911999 | 2 | 8-Jul-91 | | 1 | | | | | 1 | |
| 912000 | 2 | 9-Jul-91 | | 1 | | 1 | 1 | | 3 | |
| 912001 | 2 | 9-Jul-91 | | | | 1 | | 1 | 2 | |
| 912003 | 2 | 9-Jul-91 | | | | | | | 0 | |
| 912076 | 2 | 10-Jul-91 | | | | | | 1 | 1 | |
| 912151 | 2 | 12-Jul-91 | | | | | | | 0 | |
| 912154 | 2 | 15-Jul-91 | | 1 | | | | | 1 | |
| 912179 | 2 | 23-Jul-92 | | | | | | | 0 | |
| 912183 | 2 | 23-Jul-92 | | | | | | | 0 | |
| 912252 | 2 | 26-Jul-91 | | 1 | | | | | 1 | |
| 912253 | 2 | 26-Jul-91 | | 1 | | | | | 1 | |
| 912256 | 2 | 29-Jul-91 | | | | | | | 0 | |
| 912306 | 2 | 1-Aug-91 | | 1 | | | | | 1 | |
| 912340 | 2 | 11-Aug-91 | | 1 | | | | | 1 | |
| 912343 | 2 | 12-Aug-91 | | 1 | | | | | 1 | |
| 912348 | 2 | 13-Aug-91 | | 1 | | | | | 1 | |
| 912494 | 2 | 7-Aug-91 | | | 1 | | | | 1 | |
| 912496 | 2 | 15-Aug-91 | | 1 | | | | | 1 | |
| 912497 | 2 | 15-Aug-91 | | 1 | | | | | 1 | |
| 912504 | 2 | 19-Aug-91 | | | 1 | | | | 1 | |
| 912505 | 2 | 19-Aug-91 | | 1 | | | 1 | | 2 | |
| 912509 | 2 | 20-Aug-91 | | | | | 1 | | 1 | |
| 912525 | 2 | 26-Aug-91 | | | | 1 | | | 1 | |
| 912527 | 2 | 26-Aug-91 | | | | | 1 | | 1 | |
| 912532 | 2 | 27-Aug-91 | | 1 | | | | | 1 | |
| 912617 | 2 | 29-Aug-91 | | | | 1 | 1 | | 2 | |
| 912618 | 2 | 29-Aug-91 | | | | | 1 | | 1 | |
| 912623 | 2 | 30-Aug-91 | | 1 | | | | 1 | 2 | |
| 912628 | 2 | 3-Sep-91 | | 1 | | | | | 1 | |
| 912829 | 2 | 6-Sep-91 | | | | | | | 0 | |
| 912831 | 2 | 6-Sep-91 | | 1 | | | | | 1 | |
| 912968 | 2 | 12-Sep-91 | | | | | 1 | | 1 | |
| 912969 | 2 | 12-Sep-91 | | | | | | | 0 | |
| 912970 | 2 | 12-Sep-91 | | 1 | | | | | 1 | |
| 912978 | 2 | 16-Sep-91 | | 1 | | 1 | | | 2 | |
| 913031 | 2 | 21-Sep-91 | | 1 | | | | | 1 | |
| 913042 | 2 | 25-Sep-91 | | 2 | | | | | 2 | |
| 913114 | 2 | 1-Oct-91 | | | 1 | | 1 | | 2 | |
| 913131 | 2 | 4-Oct-91 | | 1 | | 2 | | | 3 | |
| 913136 | 2 | 7-Oct-91 | | 1 | | | | | 1 | |
| 913149 | 2 | 9-Oct-91 | | 1 | | | | | 1 | |
| 913150 | 2 | 9-Oct-91 | | 1 | | | | | 1 | |
| 913153 | 2 | 10-Oct-91 | | 1 | | | 1 | | 2 | |
| 913155 | 2 | 10-Oct-91 | | 1 | | | 1 | | 2 | |
| 913164 | 2 | 15-Oct-91 | | | | | | | 0 | |
| 913174 | 2 | 17-Oct-91 | | 1 | | | | | 1 | |
| 913182 | 2 | 21-Oct-91 | | | 1 | | | | 1 | |
| 913335 | 2 | 23-Oct-91 | | | | | | | 0 | |
| 913336 | 2 | 23-Oct-91 | | | | | 1 | 1 | 2 | |
| 913344 | 2 | 28-Oct-91 | | | | | | | 0 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 913351 | 2 | 29-Oct-91 | | | | | 1 | | 1 | |
| 913355 | 2 | 30-Oct-91 | | | | | | | 0 | |
| 913357 | 2 | 31-Oct-91 | | | | | | | 0 | |
| 913358 | 2 | 31-Oct-91 | | 1 | | | | | 1 | |
| 913359 | 2 | 31-Oct-91 | | 1 | | | 2 | | 3 | |
| 913363 | 2 | 4-Nov-91 | | | | | | | 0 | |
| 913500 | 2 | 8-Nov-91 | 1 | | | 1 | 1 | | 3 | |
| 913503 | 2 | 12-Nov-91 | | | | | 1 | | 1 | |
| 913512 | 2 | 18-Nov-91 | | | | | 1 | | 1 | |
| 913529 | 2 | 21-Nov-91 | | 1 | | | | | 1 | |
| 913584 | 2 | 24-Nov-91 | | 1 | | | 1 | | 2 | |
| 913587 | 2 | 29-Nov-91 | | | | | 1 | | 1 | |
| 913676 | 2 | 2-Dec-91 | | | | 1 | | | 1 | |
| 913677 | 2 | 3-Dec-91 | | | | | 1 | | 1 | |
| 913692 | 2 | 5-Dec-91 | | | | 1 | | | 1 | |
| 913693 | 2 | 5-Dec-91 | | | | | | | 0 | |
| 913695 | 2 | 6-Dec-91 | | 1 | | | | | 1 | |
| 913696 | 2 | 6-Dec-91 | | | | 1 | | | 1 | |
| 913697 | 2 | 00-Dec-91 | | | | | 1 | | 1 | |
| 913791 | 2 | 6-Dec-91 | 1 | | | | | | 1 | |
| 913793 | 2 | 7-Dec-91 | | | | | | | 0 | |
| 913803 | 2 | 8-Dec-91 | | | | | | | 0 | |
| 913831 | 2 | 17-Dec-91 | | 1 | | 1 | 1 | | 3 | |
| 913870 | 2 | 24-Dec-91 | | 1 | | | | | 1 | |
| 914007 | 2 | 31-Dec-91 | | 1 | | | | | 1 | |
| 920003 | 2 | 5-Jan-92 | | 1 | | | | | 1 | |
| 920005 | 2 | 5-Jan-92 | 1 | 1 | | 1 | | | 3 | |
| 920072 | 2 | 7-Jan-92 | | | | | | | 0 | |
| 920088 | 2 | 8-Jan-92 | | 1 | | | | | 1 | |
| 920128 | 2 | 9-Jan-92 | | 1 | | | | | 1 | |
| 920133 | 2 | 10-Jan-92 | | 1 | | | | | 1 | |
| 920134 | 2 | 10-Jan-92 | | | | | | | 0 | |
| 920136 | 2 | 10-Jan-92 | | 1 | | | 1 | | 2 | |
| 920137 | 2 | 10-Jan-92 | | 1 | | | | 1 | 2 | |
| 920140 | 2 | 10-Jan-92 | | | 1 | | | | 1 | |
| 920240 | 2 | 17-Jan-92 | | | | | | | 0 | |
| 920241 | 2 | 17-Jan-92 | | 1 | 1 | | | | 2 | |
| 920274 | 2 | 22-Jan-92 | | 1 | | 1 | 1 | | 3 | |
| 920275 | 2 | 22-Jan-92 | | | | | | | 0 | |
| 920276 | 2 | 22-Jan-92 | | 1 | | | | | 1 | |
| 920286 | 2 | 22-Jan-92 | | | | | | | 0 | |
| 920288 | 2 | 27-Jan-92 | 1 | | | | 1 | | 2 | |
| 920290 | 2 | 27-Jan-92 | | 1 | | | | | 1 | |
| 920310 | 2 | 30-Jan-92 | | | | | | | 0 | |
| 920317 | 2 | 31-Jan-92 | | 1 | | | | | 1 | |
| 920318 | 2 | 31-Jan-92 | | | | | 1 | | 1 | |
| 900006 | 4 | 4-Jan-90 | | | | | | | 0 | |
| 900512 | 4 | 12-Apr-90 | | | | | | | 0 | |
| 900834 | 4 | 18-Jul-90 | | | | | | | 0 | |
| 900904 | 4 | 19-Jul-90 | 1 | | | | | | 1 | |
| 901022 | 4 | 2-Aug-90 | | 1 | | | | | 1 | |
| 901245 | 4 | 25-Aug-90 | | 1 | | | | | 1 | |
| 901345 | 4 | 11-Sep-90 | | | | | | | 0 | |
| 901407 | 4 | 21-Sep-90 | 1 | | | | | | 1 | |
| 901410 | 4 | 24-Jul-90 | | | | 1 | | | 1 | |
| 901426 | 4 | 26-Sep-90 | | | | | | | 0 | |
| 901467 | 4 | 27-Sep-90 | | | | | | | 0 | |
| 901485 | 4 | 8-Oct-90 | 1 | | | | | | 1 | |
| 901600 | 4 | 31-Oct-90 | 1 | 1 | | | | | 2 | |
| 901603 | 4 | 3-Nov-90 | | 1 | | | | | 1 | |
| 901737 | 4 | 21-Nov-90 | | 1 | | | | | 1 | |
| 901809 | 4 | 28-Nov-90 | | | | | | | 0 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 901843 | 4 | 30-Nov-90 | | | | | | | 0 | |
| 901847 | 4 | 6-Dec-90 | | | | | | 1 | 1 | |
| 901862 | 4 | 14-Dec-90 | | 1 | | | 1 | | 2 | |
| 901874 | 4 | 17-Dec-90 | | 1 | | 1 | | | 2 | |
| 902007 | 4 | 19-Dec-90 | | 1 | | | | | 1 | |
| 902029 | 4 | 24-Dec-90 | | 1 | | | | | 1 | |
| 902030 | 4 | 24-Dec-90 | | 1 | | | | | 1 | |
| 902031 | 4 | 24-Dec-90 | | 1 | | 1 | | | 2 | |
| 902037 | 4 | 31-Dec-90 | | 1 | | 1 | | | 2 | |
| 910025 | 4 | 12-Jan-91 | | | | | | | 0 | |
| 910026 | 4 | 14-Jan-91 | | | | 1 | | | 1 | |
| 910041 | 4 | 17-Jan-91 | | 1 | | | | | 1 | |
| 910082 | 4 | 18-Jan-91 | | 1 | 1 | | | | 2 | |
| 910084 | 4 | 18-Jan-91 | | 1 | | | | | 1 | |
| 910087 | 4 | 19-Jan-91 | 1 | | | | | | 1 | |
| 910088 | 4 | 19-Jan-91 | | 1 | | | | | 1 | |
| 910207 | 4 | 22-Jan-91 | | | | 1 | | | 1 | |
| 910209 | 4 | 31-Jan-91 | | | | | | 1 | 1 | |
| 910519 | 4 | 1-Feb-91 | | 1 | | | | | 1 | |
| 910542 | 4 | 21-Feb-91 | 1 | 1 | 1 | | | 1 | 4 | |
| 910823 | 4 | 26-Feb-91 | 1 | | | | | | 1 | |
| 910832 | 4 | 1-Mar-91 | | 1 | | | | | 1 | |
| 910834 | 4 | 7-Mar-91 | 1 | 1 | | | | | 2 | |
| 910857 | 4 | 17-Mar-91 | | 1 | | | | | 1 | |
| 910956 | 4 | 22-Mar-91 | 1 | 1 | | | | | 2 | |
| 910967 | 4 | 28-Mar-91 | | 1 | | | | | 1 | |
| 910976 | 4 | 29-Mar-91 | | 1 | | | | | 1 | |
| 910979 | 4 | 29-Mar-91 | | 1 | 1 | 1 | 1 | | 4 | |
| 910982 | 4 | 2-Apr-91 | | | | | | | 0 | |
| 910985 | 4 | 3-Apr-91 | | | | | | | 0 | |
| 910988 | 4 | 3-Apr-91 | | | | | | | 0 | |
| 911027 | 4 | 4-Apr-91 | | 1 | | | | | 1 | |
| 911028 | 4 | 4-Apr-91 | | 1 | | | | | 1 | |
| 911030 | 4 | 4-Apr-91 | | 1 | | 1 | | | 2 | |
| 911031 | 4 | 4-Apr-91 | | 1 | | | | | 1 | |
| 911041 | 4 | 8-Apr-91 | | | | | 1 | | 1 | |
| 911080 | 4 | 16-Apr-91 | | | | 1 | | | 1 | |
| 911090 | 4 | 18-Apr-91 | | 1 | | | | | 1 | |
| 911097 | 4 | 19-Apr-91 | | | | | | | 0 | |
| 911098 | 4 | 20-Apr-91 | | 1 | 1 | 1 | | | 3 | |
| 911099 | 4 | 22-Apr-91 | | 1 | | | | | 1 | |
| 911174 | 4 | 25-Apr-91 | | 1 | | | 1 | | 2 | |
| 911175 | 4 | 25-Apr-91 | 1 | 1 | | | | | 2 | |
| 911185 | 4 | 26-Apr-91 | 1 | | | | | | 1 | |
| 911264 | 4 | 6-May-91 | | 1 | | | | | 1 | |
| 911285 | 4 | 9-May-91 | | | | | 1 | | 1 | |
| 911290 | 4 | 9-May-91 | | | | | | | 0 | |
| 911292 | 4 | 12-May-91 | | | | | | | 0 | |
| 911296 | 4 | 13-May-91 | | 1 | | | | | 1 | |
| 911305 | 4 | 16-May-91 | | 1 | | 1 | 1 | | 3 | |
| 911333 | 4 | 22-May-91 | | | | | | | 0 | |
| 911352 | 4 | 23-May-91 | | | | 1 | 1 | | 2 | |
| 911353 | 4 | 23-May-91 | 1 | 1 | | | | | 2 | |
| 911380 | 4 | 28-May-91 | | | | | | | 0 | |
| 911452 | 4 | 30-May-91 | | | | | | | 0 | |
| 911465 | 4 | 31-May-91 | | | | | | | 0 | |
| 911480 | 4 | 5-Jun-91 | | 1 | | | | | 1 | |
| 911499 | 4 | 7-Jun-91 | | | | | 1 | | 1 | |
| 911589 | 4 | 17-Jun-91 | 1 | 1 | | 1 | | | 3 | |
| 911594 | 4 | 7-Jun-91 | | | 1 | | | | 1 | |
| 911595 | 4 | 18-Jun-91 | | 1 | | | | | 1 | |
| 911598 | 4 | 18-Jun-91 | | 1 | | | | | 1 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 911603 | 4 | 20-Jun-91 | | 1 | | | | | 1 | |
| 911691 | 4 | 21-Jun-91 | | 1 | | | | | 1 | |
| 911693 | 4 | 21-Jun-91 | | 1 | | | | | 1 | |
| 911694 | 4 | 21-Jun-91 | | | | | | | 0 | |
| 911697 | 4 | 24-Jun-91 | | | | | | | 0 | |
| 911700 | 4 | 24-Jun-91 | | | 1 | 1 | | | 2 | |
| 911703 | 4 | 25-Jun-91 | | | | | | | 0 | |
| 911707 | 4 | 26-Jun-91 | | 1 | | 1 | | | 2 | |
| 911708 | 4 | 26-Jun-91 | | 1 | | 1 | | | 2 | |
| 911724 | 4 | 27-Jun-91 | | | | 1 | | | 1 | |
| 911979 | 4 | 2-Jul-91 | | 1 | | | | | 1 | |
| 911980 | 4 | 2-Jul-91 | | 1 | | 1 | | | 2 | |
| 911981 | 4 | 3-Jul-91 | | | | | | | 0 | |
| 911983 | 4 | 4-Jul-91 | | | | | | | 0 | |
| 911995 | 4 | 8-Jul-91 | | 1 | | 1 | | | 2 | |
| 912077 | 4 | 10-Jul-91 | | | | | 1 | 1 | 2 | |
| 912152 | 4 | 13-Jul-91 | | 1 | | | | | 1 | |
| 912155 | 4 | 15-Jul-91 | | | | | 1 | | 1 | |
| 912161 | 4 | 16-Jul-91 | | 1 | | 1 | 1 | | 3 | |
| 912166 | 4 | 17-Jul-91 | | | | | | | 0 | |
| 912182 | 4 | 22-Jul-92 | | 1 | | 1 | 1 | | 3 | |
| 912184 | 4 | 22-Jul-92 | | 1 | | | | | 1 | |
| 912190 | 4 | 24-Jul-91 | | 1 | | | | | 1 | |
| 912191 | 4 | 24-Jul-91 | | 1 | | | | | 1 | |
| 912192 | 4 | 24-Jul-91 | | 1 | | | | | 1 | |
| 912248 | 4 | 26-Jul-91 | 1 | 1 | | | | 1 | 3 | |
| 912250 | 4 | 26-Jul-91 | | | | | | 1 | 1 | |
| 912259 | 4 | 30-Jul-91 | | | | | 1 | | 1 | |
| 912322 | 4 | 2-Aug-91 | 1 | 1 | | | | | 2 | |
| 912323 | 4 | 2-Aug-91 | | | | | | | 0 | |
| 912331 | 4 | 7-Aug-91 | | | | | | 1 | 1 | |
| 912332 | 4 | 7-Aug-91 | | | | | | | 0 | |
| 912334 | 4 | 7-Aug-91 | | 1 | 1 | | | | 2 | |
| 912341 | 4 | 10-Aug-91 | | 1 | | | | | 1 | |
| 912495 | 4 | 15-Aug-91 | | 1 | | | 1 | | 2 | |
| 912500 | 4 | 16-Aug-91 | | 1 | | | | | 1 | |
| 912502 | 4 | 18-Aug-91 | | 1 | | 1 | | | 2 | |
| 912506 | 4 | 19-Aug-91 | | | | | | | 0 | |
| 912514 | 4 | 21-Aug-91 | | 1 | 1 | | | | 2 | |
| 912531 | 4 | 27-Aug-91 | 1 | 1 | | | | | 2 | |
| 912533 | 4 | 27-Aug-91 | | | | | 1 | | 1 | |
| 912613 | 4 | 29-Aug-91 | | | | | 1 | | 1 | |
| 912615 | 4 | 29-Aug-91 | | | | | | | 0 | |
| 912627 | 4 | 3-Sep-91 | | 1 | | | | | 1 | |
| 912821 | 4 | 5-Sep-91 | | | | | | | 0 | |
| 912828 | 4 | 6-Sep-91 | | | | 1 | | | 1 | |
| 912835 | 4 | 8-Sep-91 | | | | | | | 0 | |
| 912838 | 4 | 9-Sep-91 | 1 | | | | | 1 | 2 | |
| 912840 | 4 | 9-Sep-91 | | 1 | | 1 | | | 2 | |
| 912958 | 4 | 10-Sep-91 | | | | | 1 | 1 | 2 | |
| 912974 | 4 | 13-Sep-91 | | 1 | 1 | | | | 2 | |
| 912977 | 4 | 16-Sep-91 | | 1 | | | | | 1 | |
| 912979 | 4 | 16-Sep-91 | | 1 | 1 | | 2 | | 4 | |
| 912983 | 4 | 17-Sep-91 | | 1 | | | | | 1 | |
| 913030 | 4 | 21-Sep-91 | | 1 | | | 1 | | 2 | |
| 913052 | 4 | 26-Sep-91 | | 1 | | | 1 | 1 | 3 | |
| 913053 | 4 | 26-Sep-91 | | | | | 1 | | 1 | |
| 913054 | 4 | 26-Sep-91 | | | | | 1 | | 1 | |
| 913128 | 4 | 4-Oct-91 | | | | | 1 | 1 | 2 | |
| 913138 | 4 | 7-Oct-91 | | 1 | | | | | 1 | |
| 913152 | 4 | 10-Oct-91 | | 1 | | | 2 | | 3 | |
| 913156 | 4 | 11-Oct-91 | | 1 | | | | | 1 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 913158 | 4 | 11-Oct-91 | | | | | 1 | | 1 | |
| 913163 | 4 | 15-Oct-91 | | | 1 | | | | 1 | |
| 913166 | 4 | 16-Oct-91 | | 1 | | | | | 1 | |
| 913167 | 4 | 16-Oct-91 | | | | | | | 0 | |
| 913169 | 4 | 16-Oct-91 | | 1 | | 1 | | | 2 | |
| 913180 | 4 | 21-Oct-91 | | | | | | 1 | 1 | |
| 913333 | 4 | 23-Oct-91 | | 1 | | | | | 1 | |
| 913347 | 4 | 28-Oct-91 | | 1 | | | 1 | | 2 | |
| 913353 | 4 | 29-Oct-91 | | | | | 1 | | 1 | |
| 913360 | 4 | 1-Nov-91 | | 1 | | | | 1 | 2 | |
| 913385 | 4 | 6-Nov-91 | | | | | | | 0 | |
| 913387 | 4 | 6-Nov-91 | | 1 | | | | | 1 | |
| 913501 | 4 | 8-Nov-91 | | | | | 1 | 1 | 2 | |
| 913510 | 4 | 15-Nov-91 | | 1 | | | | | 1 | |
| 913586 | 4 | 29-Nov-91 | | | | | | 1 | 1 | |
| 913824 | 4 | 16-Dec-91 | | | | | 1 | | 1 | |
| 913829 | 4 | 17-Dec-91 | | 1 | | | | | 1 | |
| 914006 | 4 | 31-Dec-91 | | 1 | | | | | 1 | |
| 920009 | 4 | 6-Jan-92 | | 1 | | | | | 1 | |
| 920139 | 4 | 10-Jan-92 | | | | | | | 0 | |
| 920141 | 4 | 10-Jan-92 | 1 | | | | 1 | | 2 | |
| 920296 | 4 | 28-Jan-92 | | 1 | | | | | 1 | |
| 920308 | 4 | 30-Jan-93 | | 1 | | | | | 1 | |
| 900194 | 8.5 | 18-Feb-90 | 1 | | | | | | 1 | |
| 900544 | 8.5 | 3-May-90 | | | | 1 | | | 1 | |
| 900553 | 8.5 | 3-May-90 | | | | | | | 0 | |
| 900554 | 8.5 | 3-May-90 | | | | 1 | | | 1 | |
| 900669 | 8.5 | 26-Jul-90 | | | | | | 1 | 1 | |
| 901019 | 8.5 | 1-Sep-90 | | | | 1 | | | 1 | |
| 901020 | 8.5 | 1-Aug-90 | | | | | | | 0 | |
| 901023 | 8.5 | 2-Aug-90 | | 1 | | 1 | | | 2 | |
| 901228 | 8.5 | 23-Aug-90 | | | | 1 | | | 1 | |
| 901230 | 8.5 | 24-Aug-90 | | | | | | | 0 | |
| 901232 | 8.5 | 26-Aug-90 | | | | | | | 0 | |
| 901246 | 8.5 | 25-Aug-90 | | 1 | | 1 | | | 2 | |
| 901408 | 8.5 | 21-Sep-90 | | | | 1 | | | 1 | |
| 901409 | 8.5 | 24-Sep-90 | | | | 1 | | | 1 | |
| 901491 | 8.5 | 12-Oct-90 | | | | 1 | | | 1 | |
| 901505 | 8.5 | 22-Oct-90 | | | | 1 | | | 1 | |
| 901580 | 8.5 | 25-Oct-90 | 1 | | | | | | 1 | |
| 901595 | 8.5 | 26-Oct-90 | | | | | | | 0 | |
| 901598 | 8.5 | 30-Oct-90 | | 1 | | 1 | | | 2 | |
| 901601 | 8.5 | 2-Nov-90 | | 1 | | 1 | | | 2 | |
| 901604 | 8.5 | 4-Nov-90 | | | | 1 | | | 1 | |
| 901704 | 8.5 | 7-Nov-90 | | | | 1 | | 1 | 2 | |
| 901717 | 8.5 | 12-Nov-90 | | | | 1 | | | 1 | |
| 901718 | 8.5 | 13-Nov-90 | | | | 1 | | 1 | 2 | |
| 901725 | 8.5 | 19-Nov-90 | | | 1 | | | | 1 | |
| 901731 | 8.5 | 20-Nov-90 | 1 | | | 1 | | | 2 | |
| 901732 | 8.5 | 20-Nov-90 | 2 | | | | | | 2 | |
| 901734 | 8.5 | 20-Nov-90 | | | | | | | 0 | |
| 901736 | 8.5 | 21-Nov-90 | | | 1 | 1 | | | 2 | |
| 901848 | 8.5 | 6-Dec-90 | | 1 | | | | | 1 | |
| 901849 | 8.5 | 6-Dec-90 | | 1 | | | | | 1 | |
| 901859 | 8.5 | 13-Dec-90 | | 1 | | | | | 1 | |
| 901860 | 8.5 | 13-Dec-90 | | | | | | | 0 | |
| 901863 | 8.5 | 14-Dec-90 | | | | | | | 0 | |
| 901866 | 8.5 | 14-Dec-90 | | | | 1 | | | 1 | |
| 901870 | 8.5 | 17-Dec-90 | | 1 | | | | | 1 | |
| 901871 | 8.5 | 17-Dec-90 | | 1 | | 1 | | | 2 | |
| 901872 | 8.5 | 17-Dec-90 | | 1 | | 1 | | | 2 | |
| 901873 | 8.5 | 17-Dec-90 | | 1 | | | 1 | | 2 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 901875 | 8.5 | 17-Dec-90 | 1 | | | | | | 1 | |
| 902009 | 8.5 | 19-Dec-90 | | | | 1 | | | 1 | |
| 902012 | 8.5 | 19-Dec-90 | | | | | | | 0 | |
| 902027 | 8.5 | 21-Dec-90 | | | | | | | 0 | |
| 902039 | 8.5 | 31-Dec-90 | | 1 | | | | | 1 | |
| 910003 | 8.5 | 4-Jan-91 | | 1 | 1 | | | | 2 | |
| 910005 | 8.5 | 7-Jan-91 | | | | | | | 0 | |
| 910006 | 8.5 | 7-Jan-91 | | | | 2 | | | 2 | |
| 910007 | 8.5 | 7-Jan-81 | | 1 | | | | | 1 | |
| 910018 | 8.5 | 10-Jan-91 | | | | | | | 0 | |
| 910086 | 8.5 | 18-Jan-91 | | 1 | | | 1 | | 2 | |
| 910184 | 8.5 | 26-Jan-91 | | 1 | | | | | 1 | |
| 910214 | 8.5 | 27-Jan-91 | | 1 | 1 | 2 | | | 4 | |
| 910465 | 8.5 | 4-Feb-91 | | | | | | | 0 | |
| 910467 | 8.5 | 4-Feb-91 | | | | 1 | | | 1 | |
| 910468 | 8.5 | 4-Feb-91 | | | | | | 1 | 1 | |
| 910491 | 8.5 | 7-Feb-91 | | | | | | 1 | 1 | |
| 910492 | 8.5 | 7-Feb-91 | | | | 1 | | | 1 | |
| 910508 | 8.5 | 10-Feb-91 | | | | | | | 0 | |
| 910511 | 8.5 | 14-Feb-91 | 1 | | | | | | 1 | |
| 910513 | 8.5 | 15-Feb-91 | | 1 | | | | | 1 | |
| 910517 | 8.5 | 16-Feb-91 | | 1 | | 1 | | | 2 | |
| 910518 | 8.5 | 16-Feb-91 | | 1 | | | | | 1 | |
| 910520 | 8.5 | 18-Feb-91 | 1 | 1 | | | 1 | | 3 | |
| 910541 | 8.5 | 21-Feb-91 | | 1 | | | | 1 | 2 | |
| 910543 | 8.5 | 26-Feb-91 | | 1 | | | | | 1 | |
| 910624 | 8.5 | 28-Feb-91 | | 1 | | | | 1 | 2 | |
| 910625 | 8.5 | 6-Mar-91 | | | | | | 1 | 1 | |
| 910626 | 8.5 | 6-Mar-91 | | | | 1 | | | 1 | |
| 910627 | 8.5 | 6-Mar-91 | | 1 | 1 | | | | 2 | |
| 910825 | 8.5 | 7-Mar-91 | 1 | 1 | | | | 1 | 3 | |
| 910833 | 8.5 | 7-Mar-91 | | | | 1 | 1 | | 2 | |
| 910835 | 8.5 | 7-Mar-91 | | 1 | | | | | 1 | |
| 910837 | 8.5 | 7-Mar-91 | | | | 1 | 1 | | 2 | |
| 910839 | 8.5 | 11-Mar-91 | | | | 1 | | | 1 | |
| 910845 | 8.5 | 14-Mar-91 | | 1 | | | 1 | | 2 | |
| 910852 | 8.5 | 15-Mar-91 | | 1 | 1 | 1 | | | 3 | |
| 910931 | 8.5 | 20-Mar-91 | | | | 1 | 1 | 1 | 3 | |
| 910932 | 8.5 | 20-Mar-91 | | 1 | | | | 1 | 2 | |
| 910957 | 8.5 | 22-Mar-91 | | 1 | 1 | | | | 2 | |
| 910959 | 8.5 | 27-Mar-91 | 1 | | | | 1 | | 2 | |
| 910968 | 8.5 | 28-Mar-91 | | 1 | | | | | 1 | |
| 910969 | 8.5 | 28-Mar-91 | | | | 1 | | | 1 | |
| 910977 | 8.5 | 29-Mar-91 | 1 | | | | 1 | | 2 | |
| 910978 | 8.5 | 29-Mar-91 | | | | 1 | | | 1 | |
| 910981 | 8.5 | 1-Apr-91 | | | 1 | 1 | | | 2 | |
| 911040 | 8.5 | 6-Apr-91 | 1 | | 1 | | | 1 | 3 | |
| 911048 | 8.5 | 9-Apr-91 | 1 | 1 | | 1 | | | 3 | |
| 911051 | 8.5 | 9-Apr-91 | | 1 | | 1 | | | 2 | |
| 911056 | 8.5 | 11-Apr-91 | | 1 | | 1 | 1 | | 3 | |
| 911057 | 8.5 | 11-Apr-91 | | | | | | 1 | 1 | |
| 911058 | 8.5 | 11-Apr-91 | | | | | 1 | 1 | 2 | |
| 911070 | 8.5 | 12-Apr-91 | | 1 | | | | 1 | 2 | |
| 911072 | 8.5 | 12-Apr-91 | 1 | | | 2 | | | 3 | |
| 911084 | 8.5 | 16-Apr-91 | | 1 | | | | | 1 | |
| 911086 | 8.5 | 17-Apr-91 | | | | | | 1 | 1 | |
| 911087 | 8.5 | 17-Apr-91 | | | | 1 | | | 1 | |
| 911100 | 8.5 | 22-Apr-91 | | | | | | | 0 | |
| 911102 | 8.5 | 22-Apr-91 | | 1 | 1 | 1 | | | 3 | |
| 911176 | 8.5 | 25-Apr-91 | | 1 | | | | | 1 | |
| 911177 | 8.5 | 25-Apr-91 | | 1 | | 1 | | | 2 | |
| 911178 | 8.5 | 25-Apr-91 | | 1 | | 1 | | | 2 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 911186 | 8.5 | 26-Apr-91 | | 1 | | | | 1 | 2 | |
| 911220 | 8.5 | 29-Apr-91 | | | | 1 | | 1 | 2 | |
| 911224 | 8.5 | 1-May-91 | | | | | 1 | | 1 | |
| 911263 | 8.5 | 6-May-91 | | 1 | 1 | | | | 2 | |
| 911286 | 8.5 | 9-May-91 | | 1 | | | | | 1 | |
| 911299 | 8.5 | 14-May-91 | | | | | | | 0 | |
| 911306 | 8.5 | 16-May-91 | | 1 | | 3 | | 1 | 5 | |
| 911307 | 8.5 | 16-May-91 | | 1 | | | | 1 | 2 | |
| 911350 | 8.5 | 23-May-91 | | 1 | | | | 1 | 2 | |
| 911367 | 8.5 | 24-May-91 | | | | | 1 | | 1 | |
| 911368 | 8.5 | 24-May-91 | | 1 | | 1 | | | 2 | |
| 911450 | 8.5 | 30-May-91 | | | | 2 | 1 | 1 | 4 | |
| 911451 | 8.5 | 30-May-91 | | | | | | | 0 | |
| 911454 | 8.5 | 30-May-91 | | | | 1 | | | 1 | |
| 911468 | 8.5 | 1-Jun-91 | | 1 | | 2 | | | 3 | |
| 911471 | 8.5 | 3-Jun-91 | 1 | 1 | | | | 1 | 3 | |
| 911472 | 8.5 | 3-Jun-91 | | 1 | | | | 1 | 2 | |
| 911473 | 8.5 | 3-Jun-91 | | 1 | | | | 1 | 2 | |
| 911492 | 8.5 | 6-Jun-91 | | | 1 | | | | 1 | |
| 911494 | 8.5 | 6-Jun-91 | | 1 | | | | 1 | 2 | |
| 911498 | 8.5 | 7-Jun-91 | | | | 1 | 1 | | 2 | |
| 911501 | 8.5 | 7-Jun-91 | | | | | | | 0 | |
| 911537 | 8.5 | 12-Jun-91 | | 1 | | | | | 1 | |
| 911538 | 8.5 | 12-Jun-91 | | | | 1 | | | 1 | |
| 911540 | 8.5 | 12-Jun-91 | | | | | 1 | | 1 | |
| 911543 | 8.5 | 13-Jun-91 | | | | | | | 0 | |
| 911545 | 8.5 | 13-Jun-91 | | | | 1 | 1 | 1 | 3 | |
| 911587 | 8.5 | 17-Jun-91 | | | 1 | | | | 1 | |
| 911590 | 8.5 | 17-Jun-91 | | | | | | | 0 | |
| 911592 | 8.5 | 17-Jun-91 | | 1 | | | 2 | | 3 | |
| 911593 | 8.5 | 17-Jun-91 | | | 1 | | | | 1 | |
| 911696 | 8.5 | 23-Jun-91 | | | 1 | | | | 1 | |
| 911702 | 8.5 | 25-Jun-91 | | | | | | 1 | 1 | |
| 911704 | 8.5 | 25-Jun-91 | 1 | | | 2 | | | 3 | |
| 911709 | 8.5 | 26-Jun-91 | | 1 | | 2 | | | 3 | |
| 911710 | 8.5 | 26-Jun-91 | | | 1 | 2 | 2 | | 5 | |
| 911725 | 8.5 | 27-Jun-91 | 1 | 1 | 1 | | | | 3 | |
| 911952 | 8.5 | 1-Jul-91 | | 1 | | | 1 | | 2 | |
| 911984 | 8.5 | 5-Jul-91 | | 1 | | 1 | | | 2 | |
| 911986 | 8.5 | 5-Jul-91 | | | | 1 | | | 1 | |
| 911987 | 8.5 | 5-Jul-91 | 1 | | | | | | 1 | |
| 911990 | 8.5 | 6-Jul-91 | | | | | 1 | | 1 | |
| 911992 | 8.5 | 8-Jul-91 | 1 | 1 | | | 1 | | 3 | |
| 911994 | 8.5 | 8-Jul-91 | | 1 | 1 | 1 | | | 3 | |
| 912002 | 8.5 | 9-Jul-91 | | 1 | | 1 | | 1 | 3 | |
| 912149 | 8.5 | 12-Jul-91 | | | 1 | | | | 1 | |
| 912150 | 8.5 | 12-Jul-91 | | 1 | | | | | 1 | |
| 912156 | 8.5 | 15-Jul-91 | | 1 | | | 1 | | 2 | |
| 912159 | 8.5 | 16-Jul-91 | | 1 | | 1 | 1 | | 3 | |
| 912162 | 8.5 | 16-Jul-91 | | 1 | | | | | 1 | |
| 912167 | 8.5 | 17-Jul-91 | | | 1 | 1 | | | 2 | |
| 912180 | 8.5 | 22-Jul-92 | | 1 | 2 | | | | 3 | |
| 912189 | 8.5 | 24-Jul-91 | | | | | | 1 | 1 | |
| 912243 | 8.5 | 25-Jul-91 | | 1 | | | | | 1 | |
| 912255 | 8.5 | 28-Jul-91 | | 1 | | 1 | | | 2 | |
| 912258 | 8.5 | 30-Jul-91 | 1 | 1 | | | 1 | 1 | 4 | |
| 912260 | 8.5 | 30-Jul-91 | | 1 | 1 | | | | 2 | |
| 912307 | 8.5 | 1-Aug-91 | | | | | | | 0 | |
| 912333 | 8.5 | 7-Aug-91 | | 1 | | | | 1 | 2 | |
| 912335 | 8.5 | 7-Aug-91 | | 1 | | 1 | 1 | | 3 | |
| 912336 | 8.5 | 7-Aug-91 | | 1 | | 1 | | | 2 | |
| 912342 | 8.5 | 10-Aug-91 | | 1 | | | | | 1 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 912344 | 8.5 | 10-Aug-91 | | | 1 | | | | 1 | |
| 912352 | 8.5 | 13-Aug-91 | | 1 | | 1 | | 1 | 3 | |
| 912372 | 8.5 | 14-Aug-91 | | 1 | | | | | 1 | |
| 912373 | 8.5 | 14-Aug-91 | | | | | | | 0 | |
| 912498 | 8.5 | 14-Aug-91 | | | | | 1 | | 1 | |
| 912507 | 8.5 | 19-Aug-91 | | | 1 | | | 2 | 3 | |
| 912515 | 8.5 | 21-Aug-91 | | 1 | | | 1 | | 2 | |
| 912520 | 8.5 | 22-Aug-91 | | 1 | | | | | 1 | |
| 912625 | 8.5 | 3-Sep-91 | | 1 | | | 1 | | 2 | |
| 912807 | 8.5 | 4-Sep-91 | | 1 | 1 | 1 | | | 3 | |
| 912832 | 8.5 | 6-Sep-91 | | 1 | 1 | | 1 | | 3 | |
| 912834 | 8.5 | 7-Sep-91 | | 1 | | | | | 1 | |
| 912839 | 8.5 | 9-Sep-91 | | | 1 | | | | 1 | |
| 912967 | 8.5 | 12-Sep-91 | | | | 2 | 1 | 1 | 4 | |
| 912972 | 8.5 | 13-Sep-91 | | | | | | | 0 | |
| 912973 | 8.5 | 13-Sep-91 | | 1 | | | 1 | | 2 | |
| 912981 | 8.5 | 17-Sep-91 | | | | 1 | | 1 | 2 | |
| 912982 | 8.5 | 17-Sep-91 | | 1 | | 1 | | | 2 | |
| 913056 | 8.5 | 27-Sep-91 | | | 1 | | 1 | | 2 | |
| 913119 | 8.5 | 1-Oct-91 | | 1 | | 1 | 1 | | 3 | |
| 913127 | 8.5 | 4-Oct-91 | | 1 | | | | | 1 | |
| 913129 | 8.5 | 4-Oct-91 | | | 1 | 2 | | | 3 | |
| 913140 | 8.5 | 7-Oct-91 | | 1 | | | | 1 | 2 | |
| 913162 | 8.5 | 15-Oct-91 | 1 | | | | | | 1 | |
| 913334 | 8.5 | 23-Oct-91 | | | | | 1 | 1 | 2 | |
| 913516 | 8.5 | 19-Nov-91 | | 1 | | 1 | 1 | | 3 | |
| 913583 | 8.5 | 25-Nov-91 | | 1 | | 1 | | | 2 | |
| 913589 | 8.5 | 1-Dec-91 | | 1 | | | | | 1 | |
| 913675 | 8.5 | 2-Dec-91 | | 1 | 1 | | | | 2 | |
| 920007 | 8.5 | 6-Jan-92 | | 1 | | 1 | 1 | | 3 | |
| 920226 | 8.5 | 15-Jan-92 | | | | | | 1 | 1 | |
| 920292 | 8.5 | 28-Jan-92 | | | | | 1 | | 1 | |
| 893195 | 18 | 14-Sep-89 | | | | | | | 0 | 1 |
| 893208 | 18 | 14-Sep-89 | | | | | | | 0 | 1 |
| 893209 | 18 | 14-Sep-89 | | | | | | | 0 | 1 |
| 893233 | 18 | 22-Sep-89 | | | | | | | 0 | 1 |
| 893234 | 18 | 22-Sep-89 | | | | | | | 0 | 1 |
| 893235 | 18 | 25-Sep-89 | | | | | | | 0 | 1 |
| 893849 | 18 | 2-Oct-89 | | | | | | | 0 | |
| 893850 | 18 | 2-Oct-89 | | | | | | | 0 | |
| 893853 | 18 | 2-Oct-89 | | | | | | | 0 | 1 |
| 893854 | 18 | 3-Oct-89 | | | | | | | 0 | 1 |
| 893855 | 18 | 3-Oct-89 | | | | | | | 0 | 1 |
| 893856 | 18 | 5-Oct-89 | | | | | | | 0 | 1 |
| 893867 | 18 | 13-Oct-89 | | | | | | | 0 | 1 |
| 893877 | 18 | 19-Oct-89 | | | | | | | 0 | 1 |
| 893878 | 18 | 23-Oct-89 | | | | | | | 0 | 1 |
| 893885 | 18 | 26-Oct-89 | | | | | | | 0 | 1 |
| 893886 | 18 | 27-Oct-89 | | | | | | | 0 | 1 |
| 893922 | 18 | 6-Nov-89 | | | | | | | 0 | 1 |
| 893926 | 18 | 7-Nov-89 | | | | | | | 0 | 1 |
| 893934 | 18 | 14-Nov-89 | | | | | | | 0 | 1 |
| 893935 | 18 | 14-Nov-89 | | | | | | | 0 | |
| 893936 | 18 | 14-Nov-89 | | | | | | | 0 | 1 |
| 893940 | 18 | 17-Nov-89 | | | | | | | 0 | 1 |
| 893946 | 18 | 29-Nov-89 | | | | | | | 0 | 1 |
| 893948 | 18 | 21-Nov-89 | | | | | | | 0 | 1 |
| 893969 | 18 | 7-Dec-89 | | | | | | | 0 | 1 |
| 893970 | 18 | 6-Dec-89 | | | | | | | 0 | 1 |
| 894038 | 18 | 18-Dec-89 | | | | | | | 0 | |
| 894039 | 18 | 18-Dec-89 | | | | | | | 0 | |
| 894040 | 18 | 12-Dec-89 | | | | | | | 0 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 894042 | 18 | 20-Dec-89 | | | | | | | 0 | 1 |
| 894043 | 18 | 20-Dec-89 | | | | 1 | | | 1 | 1 |
| 894044 | 18 | 20-Dec-89 | | | | | | | 0 | 1 |
| 894051 | 18 | 26-Dec-89 | | | | | | | 0 | 1 |
| 894052 | 18 | 26-Dec-89 | | | | | | | 0 | 1 |
| 894057 | 18 | 28-Dec-89 | | | | 1 | | | 1 | 1 |
| 894058 | 18 | 28-Dec-89 | | | | | | | 0 | 1 |
| 894061 | 18 | 31-Dec-89 | | | | | | | 0 | 1 |
| 894062 | 18 | 31-Dec-89 | | | | | | | 0 | |
| 900001 | 18 | 1-Jan-90 | | | | | | | 0 | |
| 900003 | 18 | 2-Jan-90 | | | | | | | 0 | 1 |
| 900004 | 18 | 2-Jan-90 | | | | | | | 0 | 1 |
| 900005 | 18 | 3-Jan-90 | | | | | | | 0 | 1 |
| 900009 | 18 | 8-Jan-90 | | | | | | | 0 | 1 |
| 900010 | 18 | 8-Jan-90 | | | | | | | 0 | 1 |
| 900128 | 18 | 22-Jan-90 | | | | | | | 0 | 1 |
| 900129 | 18 | 22-Jan-90 | | | | | | | 0 | 1 |
| 900141 | 18 | 23-Jan-90 | | | | | | | 0 | |
| 900143 | 18 | 25-Jan-90 | | | | | | | 0 | 1 |
| 900162 | 18 | 29-Jan-90 | | | | | | | 0 | 1 |
| 900163 | 18 | 29-Jan-90 | | | | | | | 0 | |
| 900165 | 18 | 31-Jan-90 | | | | 1 | | | 1 | 1 |
| 900166 | 18 | 31-Jan-90 | | | | | | | 0 | 1 |
| 900167 | 18 | 4-Feb-90 | | | | | | | 0 | 1 |
| 900170 | 18 | 7-Feb-90 | | | | | | | 0 | |
| 900171 | 18 | 7-Feb-90 | | | | | | | 0 | 1 |
| 900174 | 18 | 10-Feb-90 | | | | | | | 0 | 1 |
| 900175 | 18 | 11-Feb-90 | | | | | | | 0 | |
| 900176 | 18 | 9-Feb-90 | | | | | | | 0 | |
| 900178 | 18 | 13-Feb-90 | | | | | | | 0 | 1 |
| 900183 | 18 | 14-Feb-90 | | | | | | | 0 | |
| 900184 | 18 | 14-Feb-90 | | | | | | | 0 | |
| 900203 | 18 | 21-Feb-90 | | | | | | | 0 | |
| 900227 | 18 | 25-Feb-90 | | | | | | | 0 | 1 |
| 900228 | 18 | 24-Feb-90 | | | | | | | 0 | |
| 900237 | 18 | 28-Feb-90 | | | | | | | 0 | 1 |
| 900238 | 18 | 28-Feb-90 | | | | | | | 0 | 1 |
| 900257 | 18 | 1-Mar-90 | | | | | | | 0 | |
| 900263 | 18 | 5-Mar-90 | | | | | | | 0 | |
| 900264 | 18 | 5-Mar-90 | | | | | | | 0 | |
| 900265 | 18 | 5-Mar-90 | | | | | | | 0 | 1 |
| 900266 | 18 | 5-Mar-90 | | | | | | | 0 | 1 |
| 900273 | 18 | 7-Mar-90 | | | | 1 | | | 1 | |
| 900277 | 18 | 13-Mar-90 | | | | | | | 0 | 1 |
| 900278 | 18 | 13-Mar-90 | | | | | | | 0 | |
| 900279 | 18 | 14-Mar-90 | | | | | | | 0 | |
| 900280 | 18 | 14-Mar-90 | | | | | | | 0 | |
| 900282 | 18 | 16-Mar-90 | | | | | | | 0 | |
| 900400 | 18 | 18-Mar-90 | | | | | | | 0 | 1 |
| 900401 | 18 | 19-Mar-90 | | | | | | | 0 | |
| 900402 | 18 | 30-Mar-90 | | | | | | | 0 | 1 |
| 900410 | 18 | 24-Mar-90 | | | | 1 | | | 1 | 1 |
| 900456 | 18 | 27-Mar-90 | | | 1 | | | | 1 | |
| 900457 | 18 | 27-Mar-90 | | | | | | | 0 | |
| 900458 | 18 | 27-Mar-90 | | | | | | | 0 | |
| 900467 | 18 | 4-Apr-90 | | | | | | | 0 | 1 |
| 900479 | 18 | 6-Apr-90 | | | | 1 | | | 1 | |
| 900482 | 18 | 9-Apr-90 | | | | | | | 0 | |
| 900491 | 18 | 11-Apr-90 | | | | | | | 0 | 1 |
| 900513 | 18 | 13-Apr-90 | | | | | | | 0 | 1 |
| 900516 | 18 | 13-Apr-90 | | | | | | | 0 | 1 |
| 900530 | 18 | 20-Apr-90 | | | | 1 | | | 1 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 900534 | 18 | 25-Apr-90 | | | | | | | 0 | 1 |
| 900535 | 18 | 29-Apr-90 | | | | | | | 0 | 1 |
| 900536 | 18 | 25-Apr-90 | | | | | | | 0 | |
| 900537 | 18 | 15-Jan-90 | | | | | | | 0 | 1 |
| 900551 | 18 | 3-May-90 | | | | 1 | | | 1 | |
| 900552 | 18 | 3-May-90 | | | | 1 | | | 1 | |
| 900562 | 18 | 5-May-90 | | | | | | | 0 | 1 |
| 900563 | 18 | 5-May-90 | | | | | | | 0 | |
| 900564 | 18 | 4-May-90 | | | | | | | 0 | 1 |
| 900583 | 18 | 25-May-90 | | | | 1 | | | 1 | |
| 900596 | 18 | 31-May-90 | | | | | | | 0 | 1 |
| 900638 | 18 | 31-May-90 | | | | | | | 0 | 1 |
| 900654 | 18 | 18-Jun-90 | | | | | 1 | | 1 | 1 |
| 900655 | 18 | 9-Jun-90 | | | | | | 1 | 1 | |
| 900656 | 18 | 19-Jun-90 | | | | 1 | | 1 | 2 | |
| 900657 | 18 | 19-Jul-90 | | | | | | 1 | 1 | |
| 900658 | 18 | 19-Jun-90 | | | | 1 | | 1 | 2 | |
| 900659 | 18 | 19-Jun-90 | | | | 1 | | | 1 | |
| 900660 | 18 | 20-Jun-90 | | | | | | | 0 | |
| 900668 | 18 | 25-Jun-90 | | | | | | | 0 | 1 |
| 900670 | 18 | 26-Jun-90 | | | | | | | 0 | 1 |
| 900671 | 18 | 26-Jun-90 | | | | | | 1 | 1 | |
| 900756 | 18 | 30-Jun-90 | | | | | | | 0 | |
| 900771 | 18 | 9-Jul-90 | | | | 1 | | 1 | 2 | |
| 900772 | 18 | 9-Jul-90 | | | | | | 1 | 1 | |
| 900778 | 18 | 10-Jul-90 | | | | | | 1 | 1 | |
| 900824 | 18 | 18-Jul-90 | | | | | | 1 | 1 | |
| 900835 | 18 | 18-Jul-90 | | 1 | | | | | 1 | |
| 900902 | 18 | 19-Jul-90 | | | | | 1 | | 1 | |
| 900913 | 18 | 24-Jul-90 | | | | | | 1 | 1 | |
| 900947 | 18 | 26-Jul-90 | | | | | | | 0 | |
| 900948 | 18 | 26-Jul-90 | | | | | | 1 | 1 | |
| 901021 | 18 | 2-Aug-90 | | | | 1 | | | 1 | |
| 901028 | 18 | 8-Aug-90 | | | | | | 1 | 1 | |
| 901029 | 18 | 8-Aug-90 | 1 | | | | | | 1 | |
| 901097 | 18 | 15-Aug-90 | | | | | | | 0 | |
| 901208 | 18 | 21-Aug-90 | | | | | | | 0 | |
| 901244 | 18 | 25-Aug-90 | | | | | | | 0 | |
| 901247 | 18 | 29-Aug-90 | | 1 | | | | | 1 | |
| 901250 | 18 | 3-Sep-90 | | | | | | | 0 | |
| 901251 | 18 | 3-Sep-90 | | | | | | 1 | 1 | |
| 901346 | 18 | 12-Sep-90 | | 1 | | | | 1 | 2 | |
| 901423 | 18 | 27-Sep-90 | | | | | | 1 | 1 | 1 |
| 901469 | 18 | 29-Sep-90 | | | | | | | 0 | |
| 901482 | 18 | 2-Oct-90 | 1 | | | | | | 1 | |
| 901483 | 18 | 2-Oct-90 | | | | | | 1 | 1 | |
| 901497 | 18 | 16-Oct-90 | | | | | | 1 | 1 | |
| 901597 | 18 | 29-Oct-90 | | | | | | | 0 | |
| 901705 | 18 | 7-Nov-90 | | | 1 | | | 1 | 2 | |
| 901727 | 18 | 20-Nov-90 | | | | 1 | | | 1 | |
| 901728 | 18 | 20-Nov-90 | | | | 1 | | 1 | 2 | |
| 901811 | 18 | 28-Nov-90 | | | | | | 1 | 1 | |
| 901857 | 18 | 10-Dec-90 | | | | | | 1 | 1 | |
| 901858 | 18 | 9-Dec-90 | | | | | | | 0 | |
| 901864 | 18 | 14-Dec-90 | | | | 1 | | 1 | 2 | |
| 901928 | 18 | 20-Dec-90 | | | | | | 1 | 1 | |
| 902036 | 18 | 31-Dec-90 | | | | 1 | | | 1 | |
| 910521 | 18 | 21-Feb-91 | | | | | | | 0 | |
| 911082 | 18 | 16-Apr-91 | | | | | | 1 | 1 | |
| 911375 | 18 | 28-May-91 | | | | 2 | 1 | 1 | 4 | |
| 911493 | 18 | 6-Jun-91 | | | | 1 | | | 1 | |
| 912830 | 18 | 6-Sep-91 | | 1 | | | | | 1 | |

| File No | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H&N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 913830 | 18 | 17-Dec-91 | | | | | 1 | | 1 | |
| 920004 | 18 | 5-Jan-92 | | | | | | | 0 | |

| File No. | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H & N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| All | | | 9 | 42 | 9 | 30 | 38 | 12 | 140 | 0 |
| 9 | 0 | 19-Aug-92 | | | 1 | | | | 1 | |
| 74 | 0 | 9-Mar-93 | | | | | | | 0 | |
| 158 | 0 | 19-Oct-93 | | | | | | | 0 | |
| 170 | 0 | 2-Dec-93 | | | | | | | 0 | |
| 173 | 0 | 2-Dec-93 | | | | | | | 0 | |
| 174 | 0 | 2-Dec-93 | | | | | | | 0 | |
| 72 | 0 | 28-Dec-93 | | | | | | | 0 | |
| 8 | 0 | 7-Mar-94 | | | | | | | 0 | |
| 69 | 0 | 14-Apr-94 | | | | | | | 0 | |
| 64 | 0 | 18-May-94 | | | | | 1 | | 1 | |
| 181 | 0 | 1-Jun-94 | | | | | | | 0 | |
| 63 | 0 | 13-Jun-94 | | | | | | | 0 | |
| 60 | 0 | 1-Jul-94 | | | | | | | 0 | |
| 62 | 0 | 2-Jul-94 | | 1 | | | | | 1 | |
| 55 | 0 | 7-Jul-94 | | | | | | | 0 | |
| 56 | 0 | 13-Jul-94 | | | | | | | 0 | |
| 57 | 0 | 13-Jul-94 | | | | | | | 0 | |
| 58 | 0 | 13-Jul-94 | | | | | | | 0 | |
| 159 | 0 | 17-Jul-94 | | | 1 | | | | 1 | |
| 172 | 0 | 24-Jul-94 | | | | | | | 0 | |
| 54 | 0 | 29-Jul-94 | | | | | | | 0 | |
| 53 | 0 | 7-Aug-94 | | | | | | | 0 | |
| 3 | 0 | 18-Aug-94 | | | | | | | 0 | |
| 51 | 0 | 24-Aug-94 | | | | | | | 0 | |
| 52 | 0 | 24-Aug-94 | | | | | | | 0 | |
| 50 | 0 | 5-Sep-94 | | | | | | | 0 | |
| 47 | 0 | 14-Sep-94 | | | | | | | 0 | |
| 48 | 0 | 15-Sep-94 | | | | 1 | | | 1 | |
| 186 | 0 | 19-Sep-94 | | 1 | | | | | 1 | |
| 43 | 0 | 27-Sep-94 | | | | | | | 0 | |
| 44 | 0 | 28-Sep-94 | | | | 1 | | | 1 | |
| 45 | 0 | 4-Oct-94 | | | | | | | 0 | |
| 46 | 0 | 7-Oct-94 | | | 1 | 1 | | | 2 | |
| 42 | 0 | 18-Oct-94 | | | | | | | 0 | |
| 40 | 0 | 30-Oct-94 | | | | | | | 0 | |
| 41 | 0 | 30-Oct-94 | | | | | | | 0 | |
| 182 | 0 | 1-Nov-94 | | | | | | | 0 | |
| 187 | 0 | 7-Nov-94 | | | | | | | 0 | |
| 184 | 0 | 11-Nov-94 | | | | | 1 | | 1 | |
| 167 | 0 | 14-Nov-94 | | | | | | | 0 | |
| 155 | 0 | 15-Nov-94 | | | | 1 | | | 1 | |
| 165 | 0 | 17-Nov-94 | | | | | 1 | | 1 | |
| 171 | 0 | 19-Nov-94 | | | | | | | 0 | |
| 177 | 0 | 21-Nov-94 | | | | | | | 0 | |
| 176 | 0 | 22-Nov-94 | | 1 | | | | | 1 | |
| 160 | 0 | 29-Nov-94 | | | | | 1 | | 1 | |
| 169 | 0 | 30-Nov-94 | | | | | | | 0 | |
| 178 | 0 | 30-Nov-94 | | | | | | | 0 | |
| 166 | 0 | 8-Dec-94 | | | | | | | 0 | |
| 168 | 0 | 8-Dec-94 | | | | | | | 0 | |
| 163 | 0 | 11-Dec-94 | | | | | | | 0 | |
| 175 | 0 | 11-Dec-94 | | | | 1 | | | 1 | |
| 156 | 0 | 14-Dec-94 | | 1 | | | | | 1 | |
| 179 | 0 | 15-Dec-94 | | | | | | | 0 | |
| 180 | 0 | 22-Dec-94 | | | | | | | 0 | |
| 161 | 0 | 27-Dec-94 | | | | | | | 0 | |
| 37 | 0 | 29-Dec-94 | | | | | 1 | | 1 | |
| 162 | 0 | 29-Dec-94 | | | | | | | 0 | |
| 157 | 0 | 3-Jan-95 | | 1 | | | | | 1 | |
| 188 | 0 | 3-Jan-95 | | | | 1 | | | 1 | |
| 183 | 0 | 4-Jan-95 | | | | | | | 0 | |

| File No. | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H & N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 164 | 0 | 5-Jan-95 | | | | | | | 0 | |
| 185 | 0 | 5-Jan-95 | | | | | | | 0 | |
| 1 | 0 | 6-Jan-95 | | | | | | | 0 | |
| 38 | 0 | 6-Jan-95 | | 1 | | | | | 1 | |
| 73 | 2 | 16-Dec-93 | | 1 | | | | | 1 | |
| 102 | 2 | 27-Jan-94 | | | | | | | 0 | |
| 131 | 2 | 14-Mar-94 | | | | | | | 0 | |
| 6 | 2 | 29-Mar-94 | 1 | | | | | 1 | 2 | |
| 114 | 2 | 8-May-94 | | | | | | | 0 | |
| 144 | 2 | 13-May-94 | 1 | | | | | | 1 | |
| 27 | 2 | 25-May-94 | | 1 | | | | | 1 | |
| 11 | 2 | 3-Jun-94 | | | | | | | 0 | |
| 129 | 2 | 6-Jul-94 | | | | | | | 0 | |
| 4 | 2 | 1-Aug-94 | 1 | 1 | | | | | 2 | |
| 128 | 2 | 6-Aug-94 | | | | | | | 0 | |
| 127 | 2 | 19-Aug-94 | | | | | | | 0 | |
| 112 | 2 | 2-Sep-94 | | 1 | | | | | 1 | |
| 201 | 2 | 5-Sep-94 | | 1 | | | 1 | | 2 | |
| 24 | 2 | 27-Sep-94 | | 1 | | | | | 1 | |
| 94 | 2 | 12-Oct-94 | | | | | | | 0 | |
| 95 | 2 | 13-Oct-94 | 1 | 1 | | | | | 2 | |
| 82 | 2 | 19-Oct-94 | | | | 1 | | | 1 | |
| 81 | 2 | 24-Oct-94 | 1 | | | | | | 1 | |
| 140 | 2 | 24-Oct-94 | | | | | | 1 | 1 | |
| 80 | 2 | 31-Oct-94 | | | | | | | 0 | |
| 189 | 2 | 31-Oct-94 | | 1 | | | | | 1 | |
| 223 | 2 | 31-Oct-94 | | | | | | | 0 | |
| 196 | 2 | 6-Nov-94 | | | | | | | 0 | |
| 205 | 2 | 11-Nov-94 | | | | | 1 | | 1 | |
| 226 | 2 | 11-Nov-94 | | | | | | | 0 | |
| 195 | 2 | 16-Nov-94 | | | | | | | 0 | |
| 215 | 2 | 18-Nov-94 | | | | | | | 0 | |
| 193 | 2 | 6-Dec-94 | | 1 | | | | | 1 | |
| 216 | 2 | 7-Dec-94 | | | | 1 | | | 1 | |
| 202 | 2 | 12-Dec-94 | | 1 | | | 1 | | 2 | |
| 214 | 2 | 15-Dec-94 | | 1 | | 2 | | | 3 | |
| 219 | 2 | 22-Dec-94 | | 1 | | | 1 | | 2 | |
| 194 | 2 | 29-Dec-94 | | 1 | | 1 | | | 2 | |
| 224 | 2 | 29-Dec-94 | | | | | | | 0 | |
| 200 | 2 | 3-Jan-95 | | | | | | | 0 | |
| 203 | 2 | 5-Jan-95 | | | | | | | 0 | |
| 212 | 2 | 5-Jan-95 | | | | | | | 0 | |
| 10 | 2 | 6-Jan-95 | | 1 | | | | | 1 | |
| 92 | 2 | 6-Jan-95 | | 1 | | | | | 1 | |
| 86 | 4 | 30-Jun-93 | | | | | | | 0 | |
| 104 | 4 | 25-Aug-93 | | | | | | 1 | 1 | |
| 119 | 4 | 18-Oct-93 | | | | | | | 0 | |
| 148 | 4 | 13-Dec-93 | 1 | 1 | | | | | 2 | |
| 117 | 4 | 29-Dec-93 | | | | | | | 0 | |
| 133 | 4 | 24-Jan-94 | | | | | | | 0 | |
| 30 | 4 | 28-Jan-94 | | 1 | | | | | 1 | |
| 132 | 4 | 4-Feb-94 | | | | 1 | 1 | | 2 | |
| 17 | 4 | 28-Feb-94 | | | | | | | 0 | |
| 16 | 4 | 7-Mar-94 | | | 1 | | | | 1 | |
| 29 | 4 | 14-Mar-94 | | | | | | 1 | 1 | |
| 28 | 4 | 22-Mar-94 | | | 1 | | | | 1 | |
| 68 | 4 | 5-Apr-94 | | | | 1 | | | 1 | |
| 100 | 4 | 19-Apr-94 | | 1 | | | | | 1 | |
| 83 | 4 | 20-Apr-94 | | | | 1 | | | 1 | |
| 115 | 4 | 20-Apr-94 | | 1 | | | 1 | | 2 | |
| 192 | 4 | 8-May-94 | | 1 | | | 1 | | 2 | |
| 12 | 4 | 10-May-94 | 1 | | | | 1 | | 2 | |

| File No. | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H & N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 4 | 13-Jun-94 | | | | | | | 0 | |
| 143 | 4 | 17-Jun-94 | | 1 | | | | | 1 | |
| 59 | 4 | 26-Jun-94 | | | | | | | 0 | |
| 61 | 4 | 2-Jul-94 | | | | | | | 0 | |
| 26 | 4 | 6-Jul-94 | | | | | | | 0 | |
| 142 | 4 | 27-Jul-94 | | 1 | | | | | 1 | |
| 126 | 4 | 5-Sep-94 | | | | | | | 0 | |
| 190 | 4 | 6-Sep-94 | | 1 | | | | | 1 | |
| 96 | 4 | 7-Sep-94 | | | | | 1 | | 1 | |
| 110 | 4 | 9-Sep-94 | | 1 | | 2 | | | 3 | |
| 49 | 4 | 27-Sep-94 | | | 1 | | | | 1 | |
| 141 | 4 | 21-Oct-94 | | 1 | | | | | 1 | |
| 93 | 4 | 30-Oct-94 | | | | | | | 0 | |
| 39 | 4 | 31-Oct-94 | | 1 | | | 2 | | 3 | |
| 197 | 4 | 1-Nov-94 | | | | | | | 0 | |
| 222 | 4 | 11-Nov-94 | | | | 1 | 1 | | 2 | |
| 208 | 4 | 16-Nov-94 | | 1 | | | | | 1 | |
| 221 | 4 | 18-Nov-94 | | | | | | | 0 | |
| 227 | 4 | 21-Nov-94 | | | | | 1 | | 1 | |
| 207 | 4 | 6-Dec-94 | | | | | 2 | | 2 | |
| 213 | 4 | 22-Dec-94 | | 1 | | | | | 1 | |
| 211 | 4 | 29-Dec-94 | | | | | 1 | | 1 | |
| 150 | 8.5 | 19-Oct-93 | | | | 2 | | | 2 | |
| 32 | 8.5 | 14-Jul-93 | | | | | | 1 | 1 | |
| 85 | 8.5 | 20-Jul-93 | | | | | | | 0 | |
| 107 | 8.5 | 25-Aug-93 | | | | | | | 0 | |
| 120 | 8.5 | 18-Oct-93 | | | | | | | 0 | |
| 79 | 8.5 | 21-Oct-93 | | | | | | | 0 | |
| 125 | 8.5 | 15-Nov-93 | 1 | 1 | | | 1 | | 3 | |
| 118 | 8.5 | 13-Dec-93 | | | | | 1 | | 1 | |
| 135 | 8.5 | 15-Dec-93 | | | | | | | 0 | |
| 31 | 8.5 | 11-Jan-94 | | | | | | | 0 | |
| 147 | 8.5 | 31-Jan-94 | | | | 1 | | 1 | 2 | |
| 101 | 8.5 | 2-Feb-94 | | 1 | | | | | 1 | |
| 116 | 8.5 | 9-Feb-94 | | | | | | | 0 | |
| 71 | 8.5 | 22-Feb-94 | | | | | | | 0 | |
| 18 | 8.5 | 23-Feb-94 | | | | | | 1 | 1 | |
| 84 | 8.5 | 24-Feb-94 | | | | 1 | 1 | | 2 | |
| 70 | 8.5 | 2-Mar-94 | | | | | | | 0 | |
| 14 | 8.5 | 4-Apr-94 | | 1 | | 1 | 2 | | 4 | |
| 15 | 8.5 | 5-Apr-94 | 1 | | | | 2 | 1 | 4 | |
| 67 | 8.5 | 18-Apr-94 | | | | | 1 | | 1 | |
| 146 | 8.5 | 18-Apr-94 | | | | | | 1 | 1 | |
| 99 | 8.5 | 22-Apr-94 | | | | 2 | 1 | | 3 | |
| 13 | 8.5 | 3-May-94 | | | | 1 | | | 1 | |
| 145 | 8.5 | 3-May-94 | | | | 1 | | | 1 | |
| 65 | 8.5 | 19-May-94 | | 1 | | | 1 | | 2 | |
| 66 | 8.5 | 19-May-94 | | | | | | | 0 | |
| 98 | 8.5 | 19-May-94 | | 1 | | | 1 | | 2 | |
| 130 | 8.5 | 24-Jun-94 | | | | | | 1 | 1 | |
| 191 | 8.5 | 20-Jul-94 | | 1 | | 1 | 1 | | 3 | |
| 225 | 8.5 | 26-Jul-94 | | | | | | 1 | 1 | |
| 111 | 8.5 | 7-Sep-94 | | | | | | | 0 | |
| 25 | 8.5 | 9-Sep-94 | | | 1 | | | | 1 | |
| 2 | 8.5 | 12-Sep-94 | | 1 | | | | | 1 | |
| 198 | 8.5 | 4-Nov-94 | | 1 | | | | | 1 | |
| 206 | 8.5 | 16-Nov-94 | | | | | 2 | | 2 | |
| 220 | 8.5 | 22-Dec-94 | | | | | 1 | 1 | 2 | |
| 209 | 8.5 | 27-Dec-94 | | | 1 | 2 | 1 | | 4 | |
| 20 | 18 | 18-Oct-92 | | | | | | | 0 | |
| 21 | 18 | 18-Oct-92 | | | | | | | 0 | |
| 22 | 18 | 18-Oct-92 | | | | | | | 0 | |

| File No. | Dose | Died | Brain | Pituitary | Bone | Epithelial | Thyroid | Mesenchymal | All H & N | Metaplasia |
|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 18 | 19-Oct-92 | | | | | | | 0 | |
| 34 | 18 | 19-Oct-92 | | | | | | | 0 | |
| 75 | 18 | 20-Oct-92 | | | | | | | 0 | |
| 76 | 18 | 20-Oct-92 | | | | | | | 0 | |
| 87 | 18 | 22-Oct-92 | | | | | | | 0 | |
| 88 | 18 | 22-Oct-92 | | | | | | | 0 | |
| 105 | 18 | 22-Oct-92 | | | | | | | 0 | |
| 106 | 18 | 29-Oct-92 | | | | | | | 0 | |
| 121 | 18 | 2-Nov-92 | | | | | | | 0 | |
| 137 | 18 | 3-Nov-92 | | | | | | | 0 | |
| 149 | 18 | 8-Nov-92 | | | | | | | 0 | |
| 151 | 18 | 10-Nov-92 | | | | | | | 0 | |
| 152 | 18 | 13-Nov-92 | | | | | | | 0 | |
| 199 | 18 | 9-Dec-92 | | | | | | | 0 | |
| 218 | 18 | 14-Dec-92 | | | | | | | 0 | |
| 23 | 18 | 31-Dec-92 | | | | | | | 0 | |
| 36 | 18 | 12-Jan-93 | | | | | | | 0 | |
| 91 | 18 | 13-Jan-93 | | | | | | | 0 | |
| 78 | 18 | 23-Jan-93 | | | | | | | 0 | |
| 124 | 18 | 22-Mar-93 | | | | | | | 0 | |
| 35 | 18 | 14-Apr-93 | | | | | | | 0 | |
| 139 | 18 | 17-May-93 | | | | | | | 0 | |
| 89 | 18 | 27-May-93 | | | | | | | 0 | |
| 90 | 18 | 3-Jun-93 | | | | | | | 0 | |
| 123 | 18 | 28-Jun-93 | | | | | | | 0 | |
| 138 | 18 | 12-Aug-93 | | | | | | | 0 | |
| 77 | 18 | 3-Oct-93 | | | | | | | 0 | |
| 7 | 18 | 28-Nov-93 | | | | | | | 0 | |
| 122 | 18 | 5-Jan-94 | | | | | | | 0 | |
| 154 | 18 | 15-Jan-94 | | | | | | | 0 | |
| 109 | 18 | 8-Feb-94 | | | | | | | 0 | |
| 19 | 18 | 9-Feb-94 | | | | | | | 0 | |
| 108 | 18 | 9-May-94 | | | | | | | 0 | |
| 113 | 18 | 10-May-94 | | | | | 1 | | 1 | |